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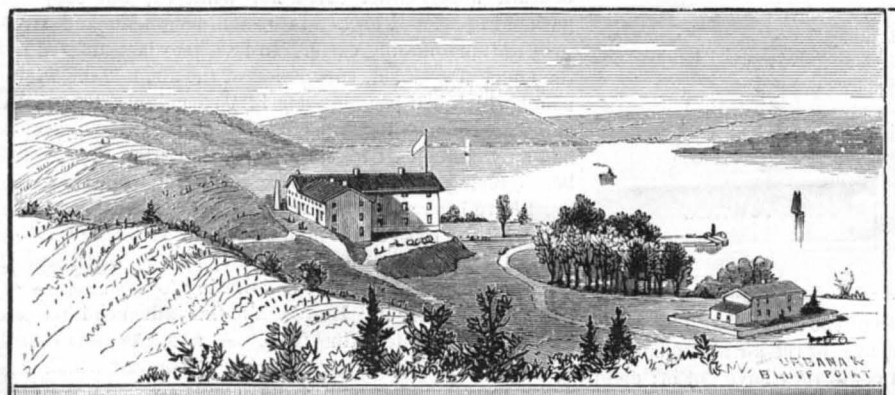

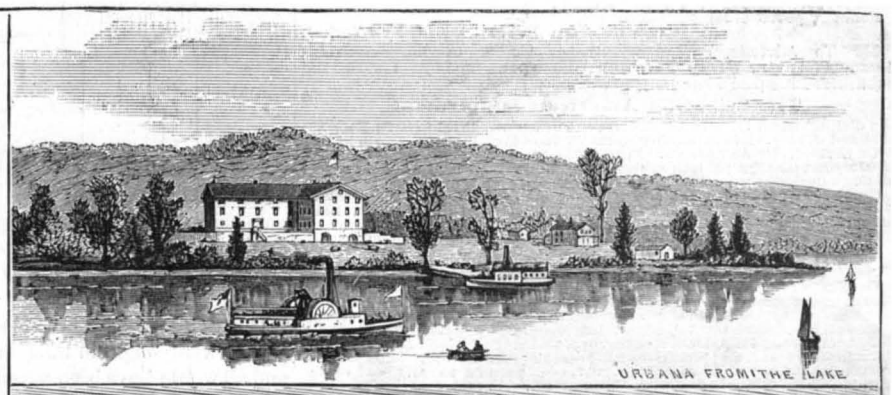

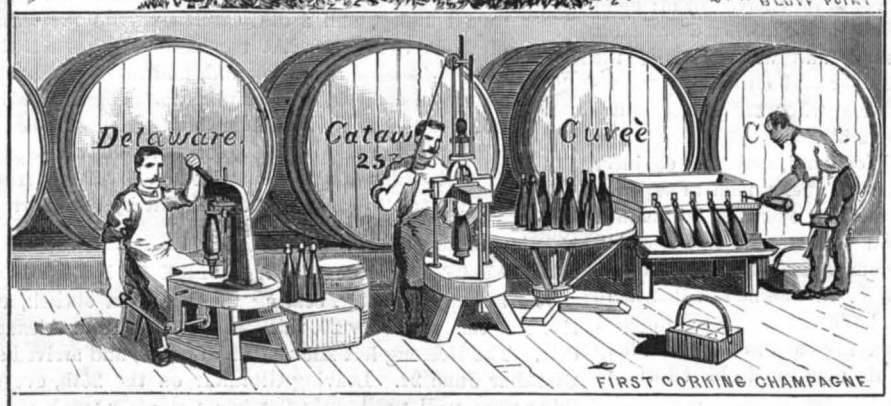

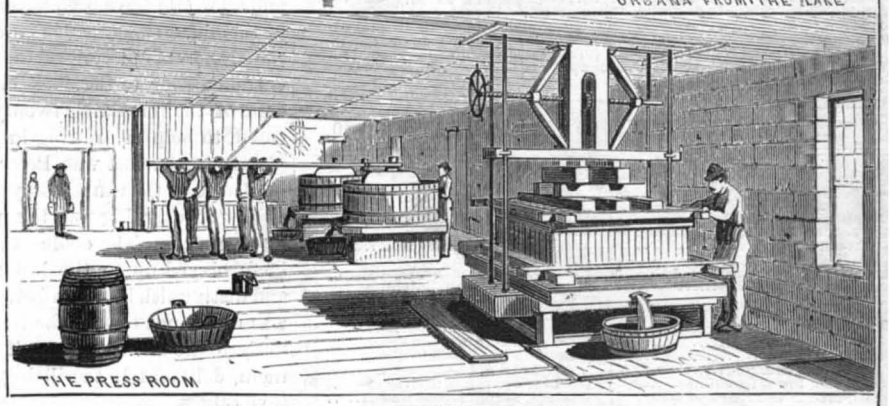

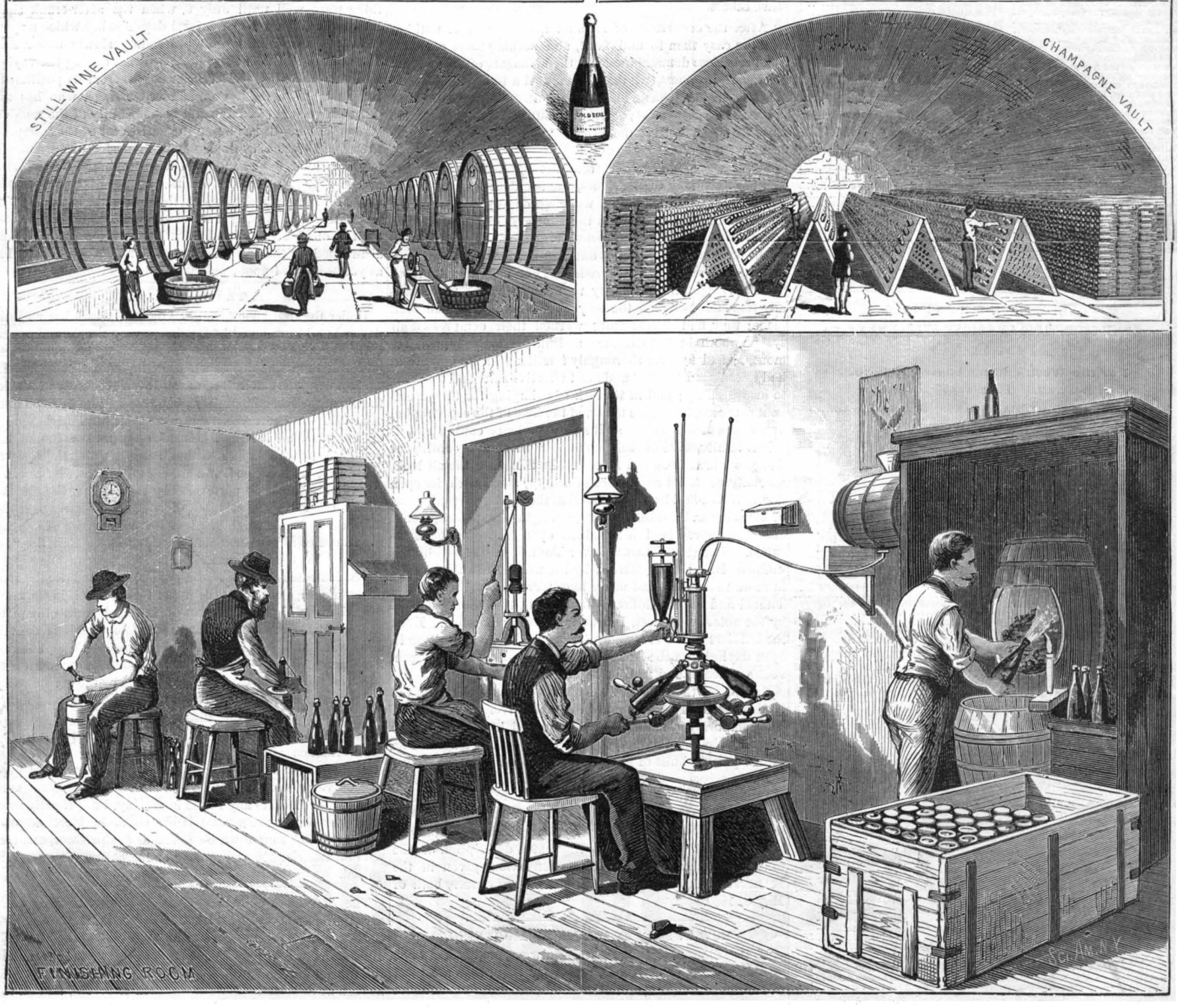

WINE MAKING.—THE URBANA WINE COMPANY, HAMMONDSPORT, N. Y.—[See page 84.]

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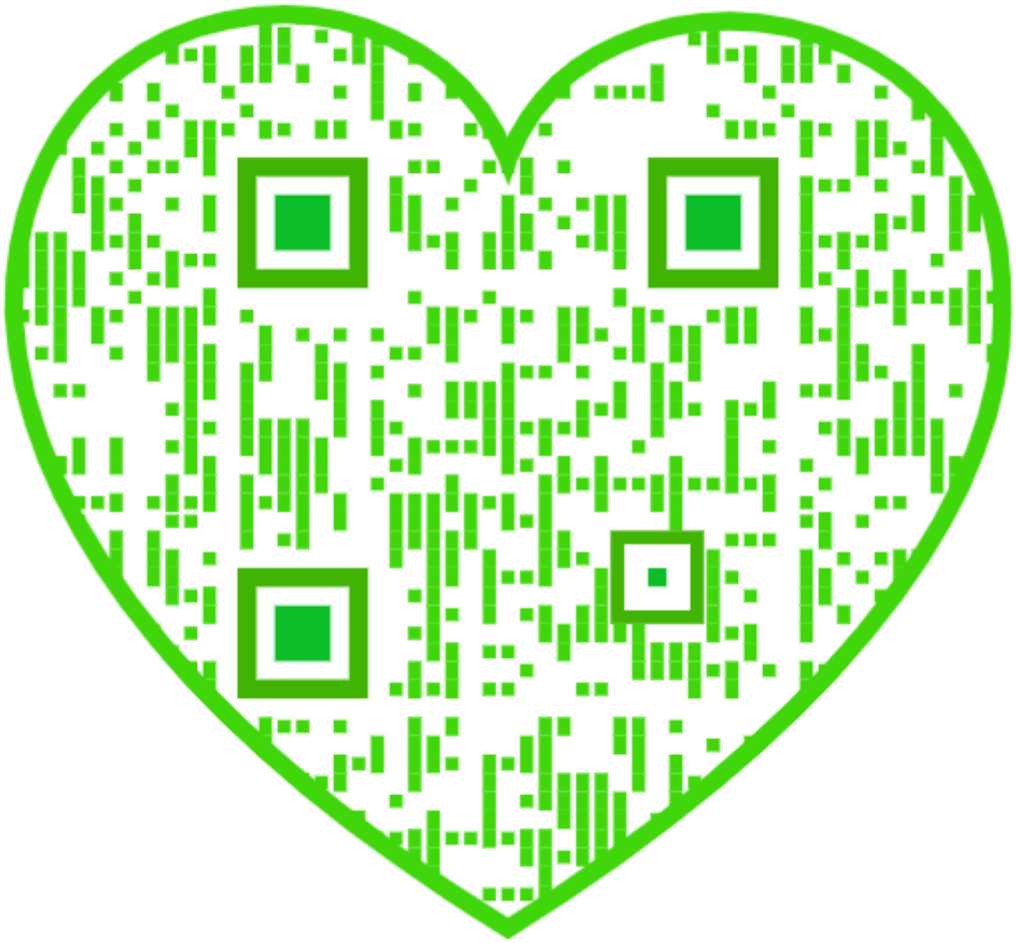

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NEW YORK, SATURDAY, AUGUST 7, 1880.

Contents.

(Illustrated articles are marked with an asterisk.)

American industries*..... 84
Andes, the, Mr Whymper among 85
Anthracite, the*..... 87
Ants, to destroy (3)..... 91
Artesian wells in California..... 81
Bengal lights (18)..... 91
Bogus sugar..... 85
Buildings, high, of the world.... 84
Can opener, novel*..... 82
Cattle drive, Texas..... 89
Coal tar, to thin (7)..... 91
Composite diamonds..... 85
Covington, Iowa, threatened..... 83
Death rate of the rich and poor. 82
Dental attach. for telephones*.. 82
Diamonds, composite..... 85
Diamonds. Mr. Hannay's..... 83
Disaster, Tay bridge..... 88
Discovery of a murder..... 81
Drill hole cleaner, pneumatic*.. 85
Driven well for fire purposes.... 89
Engineering inventions..... 83
Exhibition, milling, the recent... 81
Fern pictures, how to make..... 89
Flood rock, operations at..... 85
Flowers, old-fashion..... 90
Foreign fruits, our trade in..... 90
Fruit curing, cold air..... 90
Fruit gatherer, novel*..... 85
Fruits, foreign, our trade in..... 90
Fruits, preserving, hints for..... 85
Gas detection..... 81
Gelatine, to render insoluble (11) 91
Gold bearing newspaper, a..... 89
Gold, to amalgamate (14)..... 91
Grain weevils, pyrethrum for.... 85
Hair, to bleach (6)..... 91
Harvester, improved, an*..... 83
Hatching Spanish mackerel..... 83
High buildings of the world..... 84
Industries, American*..... 84
Inventions, engineering..... 88
Inventions, mechanical..... 86
How a water moccasin fishes..... 81
Inventions, miscellaneous..... 89
Inventions, new..... 82
Ivory, to color black (10)..... 91
Japan for wire (15)..... 91
Locomotives, Am. vs. European.. 86
Mackerel, Spanish, hatching..... 83
Making wine*.....79, 84
Marble, to remove stains from (9). 91
Mechanical inventions..... 86
Milling exhibition, the recent ... 81
Murder, a, remarkable discovery. 81
Newspaper, gold-bearing, a..... 89
Obelisk, Egyptian, arrival of 80
Oysters, Staten Island and..... 88
Patents, decisions relating to..... 90
Phosphor bronze (5)..... 91
Pictures, fern, how to make..... 89
Ponton steamer, safety, Olsen's*. 86
Punching press, new*..... 83
Pyrethrum for grain weevils..... 85
Resonator, the..... 80
Rich and poor, death rate of..... 82
Salmon, canned, by the cargo..... 92
Sapphires in Siam..... 85
Seeds, unripe, germination of..... 81
Sewers, improvement in*..... 82
Soda water (8)..... 91
Spanish mackerel, hatching..... 83
Staten Island and oysters..... 88
Steamships, improvement in*. ... 86
Sugar, bogus..... 85
Surgical operation, remarkable.... 89
Tay bridge disaster..... 88
Trade, our, in foreign fruits..... 90
Trees struck by lightning..... 80
Trick, clever, a..... 85
Tunnel, Hudson river, accident.. 80
Urbana Wine Company*.....79, 84
Vehicle, the best..... 85
Water for boilers (12)..... 91
Waterproofing paper (12)..... 91
Wells, artesian, in California..... 81
Whymper (Mr.) among the Andes. 84
Wine making*.....79, 84

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 240,

For the Week ending August 7, 1880.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Railroad Sinks..... 3818
The Vesuvius Railway. 1 large illustration..... 3819
Boilers Set in Masonry..... 3819
The Tessie Gas Producer. 3 figures. Sections of the Tessie Gas Producer at the Works of MM. Wendel, Lorraine..... 3820
High Railway Speeds. By W. BARNET LE VAN. Trial trip of locomotive 500 (made by Burnham, Parry, Williams & Co.) between Philadelphia and Jersey City and return.—Fast lines in Europe and America.—Fast locomotives..... 3820
The Berthon Duplex Dingy. 3 figures. Perspective and sections 3823
Improvements in Violins. 1 figure..... 3823

II. CHEMISTRY AND TECHNOLOGY.—Reddening of Carbolic Acid 3819
Proceedings of Chemical Society, London, June 3. On Some Products of the Oxidation of Para-toluydin. By W. H. PERKIN. On the Detection of Foreign Coloring Matter in Wine. By Dr. DUPRE. On the Action of Organo-zinc Compounds upon Nitriles and their Analogues. By Dr. FRANKLAND. On the Relation between the Molecular Structure of Carbon Compounds and their Absorptive Spectra. By Prof. HARTLEY. On a Simple Method of Determining Vapor Densities in the Barometer Vacuum. By C. A. BELL and F. L. TEED..... 3827
Protection Against Forgeries.—Photographic and otherwise. By JOHN SPILLER..... 3728
New Reaction with Gum. By C. REICHEL..... 3728
Chemical Stability of Matter in Sonorous Vibration. By M. BERTHELOT. 2 figures. Apparatus for the study of the influence of vibration on chemical phenomena..... 3829
Preparation of Malonic Acid. By E. BOURGOIN..... 3829
The Frog Poison of the Natives of Colombia..... 3829

III. PHYSICS, ETC.—Telephone with Magnetic Superexcitation. By M. ADER..... 3823
The Origin of Falling Motion. By CHAS. MORRIS. A critical study of the nature and origin of gravitation..... 3824
On an Improvement in the Sprengel Pump. By Prof. O. N. ROOD. 2 figures..... 3825
Constitution of Nebulæ..... 3826
Magnetic and Diamagnetic Elements..... 3826
Electro Capillarity. 7 figures..... 3826
On Some Points Connected with Terrestrial Magnetism. The sustaining power of the earth's magnetism.—The diurnal and other changes of terrestrial magnetism.—Earth currents and auroras..... 3827

IV. MEDICINE AND SURGERY.—"Tonga."—A Remedy for Neuralgia..... 3827
Headache and Exertion of the Exhausted Brain..... 3827
Remedy for Dyspepsia, Constipation, Sick Headache, etc..... 3827
An Improved Surgical Needle..... 3827

V. FISH AND FISHERIES.—The Berlin International Exhibition.—Neptune's Fountain.—America's great display.—Exhibits of other countries.—Prepared sea food and fresh fish..... 3816
The Utilization of Small Streams.—Value of fish ponds.—Making an artificial pond.—Yield of a half-acre fish pond. 3 figures..... 3817

VI. COMMERCE, ETC.—The American Flour Trade.—Exports to Great Britain.—Headquarters of American milling.—Minneapolis mills and water power.—Milling methods.—New mills.—New process flour.—Exportation in sacks.—American vs. British mills.—England's dependence on America for breadstuffs..... 3816
The Carrying Trade of the World..... 3817

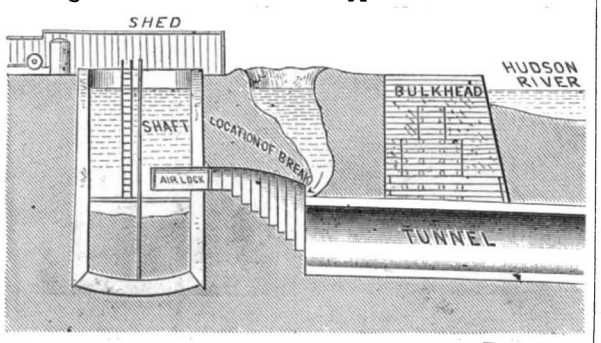
VII. ART AND ARCHITECTURE.—Neptune's Fountain at the Berlin International Fisheries Exhibition. Full page illustration..... 3815
Artists' Homes. No. 4.—Mr. Colin Hunter's house, Lugar Lodge, Kensington.—5 figures.—Perspective and plans..... 3822

VIII. MISCELLANEOUS.—Native Sports at Candahar, Afghanistan.—1 large illustration..... 3818
A Botanist in Southern California. By JOSEPH F. JAMES.—The herbs and shrubs of Southern California..... 3830

SERIOUS ACCIDENT IN THE HUDSON RIVER TUNNEL.

An accident of a serious nature, consisting in the fall of a portion of the roof of the temporary entrance to the great tunnel now being built under the Hudson river between New York and Jersey City, took place early on the morning of July 21.

It appears that the workmen were engaged in excavating for the enlarged or permanent entrance to the tunnel, on the New Jersey side of the river, near the working shaft, when, suddenly, it was found that the compressed air had broken through the loose filling of earth at the junction of the brick wall of the tunnel proper and the roof plates of the temporary entrance to the tunnel, and that the leakage was so great that it could not be stopped.



Our diagram shows the place of the accident. The workmen, twenty-eight in number, ran for the air lock chamber, and all would have been saved could they have got in; eight of them had succeeded in entering the lock, when down came the iron roof plates, earth, mud, and water, closing the entrance door to the lock chamber and cutting off the escape of the remaining twenty men, who were quickly suffocated, to help them being impossible.

Among the lost was Peter Woodland, assistant engineer in charge of the tunnel, 35 years of age, a man of superior ability in carrying on the practical operations of such a work as this. The coolness and presence of mind which he displayed up to the last moment are quite remarkable, and distinguish him as a real hero. When he saw that there was no chance to stop the leak he instantly ordered the men to fly to the air lock, himself staying back to urge and help them, deliberately sacrificing his own life in his efforts to save others.

After the occurrence of such an accident as this nothing is more easy than to find fault, and nothing more common than senseless denunciations of the managers of the works. Scores of prophets, who never handled a tool, parade their wisdom in the papers, summing up in such expressions as "reckless carelessness;" "stupid blundering;" "didn't do this;" "ought to have done that;" "might have known better;" "I told you so," etc.

So far as we can gather from the published particulars and the testimony of survivors, the accident was not due to any defect in the system of working or any neglect of the engineers or directors. On the contrary, every protection against accident and every provision for safety which intelligent prudence could point out had been adopted by them, and this is greatly to their credit. They had gained practical knowledge in successfully tunneling through the unusually treacherous soil at the very spot where this break took place; they had successfully worked their compressed air system, both in the entrance and in the main tunnel, for months; had become thoroughly familiar with its operation; had established the best and most effective rules and methods to insure safety; and in the task of enlarging for the permanent entrance, they were using, at the time of the catastrophe, every precaution which skill and experience could suggest.

But in all works of this character there are contingent dangers which none can foresee. In this case the air lock, specially provided as a place of safety, stood with its open door. Who could have foreseen that the falling earth, instead of blocking and holding it open, as might be expected, would close the door? Had it remained open all would have escaped. The great Thames River Tunnel, engineered by the eminent Brunel and guarded by his wonderful shield, caved in more than once, and many lives were lost. The Hoosac Tunnel and the St. Gothard Tunnel, cut through solid rock by the ablest engineers, had their shocking disasters. Even the builders of the elevated railways in this city, working in open daylight on the surface of the ground, could not prevent accidents, and many lives were sacrificed.

Except for the deplorable loss of life the accident in the Hudson River Tunnel would be comparatively unimportant. The temporary entrance which has caved in (shown by the step rings in our diagram) is only thirty feet in length. The tunnel proper, built of iron plates and solid brick work, two feet thick, is probably not injured. As soon as the *débris* of the fallen part can be removed, which is to be done, we learn, by means of a coffer dam, the work of tunneling under the river will proceed rapidly, as heretofore, in both headings.

Our readers will find a full illustrated description of the tunnel and the system of its construction given in the SCIENTIFIC AMERICAN and in our SUPPLEMENT, both of May 8, 1880.

HOW TREES ARE STRUCK BY LIGHTNING.

M. Colladon says: "The lightning always, or almost always, strikes the upper branches, especially those that are most elevated and most exposed to the rain storm. From thence it descends through almost the entire mass of branches to the main branches, and from these to the trunk. These large branches, and especially the trunk, being in general much poorer conductors than the young branches, the passage of the electricity produces therein heat and repellent effects which lacerate the sap wood or the bark, and sometimes scatter the *débris* to some distance (150 feet and beyond). This is a law that I have ascertained by very numerous observations. The tree recently struck in Rue des Glacis de Rive presents an interesting case, in that it confirms this law.

"It is not a very common thing in France to see trees struck by lightning in May, when their as yet young leaves have little consistency. The tree under consideration was struck essentially on its chief branch—the highest one by some inches, and situated on the southwest side. The young leaves of this summit and those of the branches immediately beneath were neither dried nor withered, but they were gashed in part and broken into small fragments and strewn over the surrounding earth. In fact, they had suffered from the effect of a violent concussion of the air, like the window panes which had been broken in two neighboring houses, and were reduced to fragments, just as they would have been had a dynamite cartridge been exploded near them. Even before seeing the tree I had made up my mind that there must have been a well or stream of water near there in contact with the roots of the poplar; for the vicinity of a spring or a subterranean stratum of water is very often the determining cause to attract the lightning to the summit of a tree standing near it. Here, again, this influence is rendered evident by two interesting facts. At about 18 feet from the tree, *on the north side*, there is a lead conduit which leads water to a laundry, and a drain which carries the waste water off under the street. At the base of the trunk the wounds *swerved toward the north*, and, midway between the tree and the lead conduit, a board placed as a border on the earth was pierced with a round hole about 4 inches in diameter, showing that the electric fluid, concentrated in a powerful jet (if that expression is allowable), shot directly from the foot of the tree toward the lead conduit by the shortest route."

ARRIVAL OF THE EGYPTIAN OBELISK AT NEW YORK.

The steamer Dessoug, bearing the Egyptian obelisk, arrived at this port July 20, thirty-seven days from Alexandria. The Dessoug left Alexandria June 12, and arrived at Gibraltar June 22. Leaving Gibraltar on the 25th, everything went well until July 6, when the after-crank shaft broke, causing a delay of several days, during which a spare shaft was fitted, the vessel proceeding slowly under sail. The obelisk had been so well stowed that during the voyage it did not move in the slightest degree from its position in the hold. Lieutenant Commander Gorringe, who has not only had the entire charge and responsibility of the removal of the obelisk, but has borne the entire cost of the enterprise thus far, reports that the stone is in perfect condition. It is 70 feet long, 8 feet square at the base, and 5 feet 3 inches at the top. It weighs 200 tons, the pedestal 43 tons, the steps, or foundation, without the pedestal, 74 tons. The machinery for lowering it weighs 60 tons. The site selected for the obelisk in Central Park has been reconsidered and abandoned by the Park Commissioners. No other site has as yet been fixed upon.

The Resonator.

Under the above name Signor Alberto B. Bach has recently devised and introduced in London a very simple and apparently very effective appliance for increasing the volume and power of the human voice when singing, and a lecture on the subject was lately delivered at the Royal Academy of Music, the use of the resonator being illustrated by Signor Bach himself during a concert which followed the lecture. In the course of his lecture Signor Bach described the mechanism of the vocal organs, and explained the modes in which their power could best be developed, and among other points he directed attention to the office performed by the hard portion of the palate, this acting as a kind of sounding board when the mouth is open for singing. It is for the purpose of increasing the efficiency of the palate in this respect that the "resonator" has been designed.

The instrument consists of a gold plate fitted to the roof of the mouth, close above the upper teeth—much in the same way as the gold palate of a set of artificial teeth—the plate having attached to it another gold plate which is convex downwards in both directions. A hollow sounding board—if we may call it so—is thus formed, which has a remarkable effect on the volume of sound producible by the person wearing the instrument. The resonator appears to have no prejudicial effect upon the distinctness of articulation, and Signor Bach states that it can be used without the slightest inconvenience after a moderate amount of practice. Of course, as Signor Bach remarks, the resonator will not give a good voice to any one who does not already possess one, nor will it eradicate any faults in singing, but properly used it is reported to have a remarkable effect in increasing the power of the sound which a singer can produce, and this without deteriorating its quality or increasing the effort required.

The *Statesman*, of Walla Walla, Washington Territory, says, in its issue of July 3, that there are indications of volcanic activity at the summit of Mount Hood. On Tuesday, June 29, a bright light burned all night steadily from the summit, at times so bright that the flames themselves could be seen as they shot out from their crater prison, and all the time throwing a bright, lurid glare upon the clouds that hung like a pall over the far-away Cascade Mountains.

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THE RECENT MILLING EXHIBITION.

For the twelve months to July 1 our exports of wheat from sixteen principal ports were 149,139,293 bushels, and our exports of wheat flour for the same period were 5,787,967 barrels—an increase of 40,045,758 bushels wheat and 437,358 barrels of flour as compared with our exports from the same ports for the year ending July 1, 1879. The value of these exports for the last year was $219,954,354, against $155,540,633 for the year preceding, the increase in value of the exports of flour alone being $5,913,863. The total exports of wheat flour from the United States for the year ending July 1, 1879, were 5,629,714 barrels, and of wheat 122,353,936 bushels, Great Britain and Ireland alone taking 2,629,665 barrels of flour, and next in order coming respectively, Brazil, British West Indies, British Possessions in North America, Hayti and San Domingo, and Cuba, while France and Germany took but 27,075 and 11,233 barrels respectively.

Probably the question which came with most force to the minds of all American millers who attended the International Exhibition lately held at Cincinnati was this: Can we, and if so by what means, considerably and permanently increase our exports of manufactured flour, instead of sending abroad so much wheat to be ground by foreign millers? While those present from abroad, who examined the wonderful display there made of American improved milling machinery, were undoubtedly at the same time revolving in their minds the possibilities of this question being answered in the affirmative. As for the trade with countries which have not been accustomed to making their own flour there can be little doubt that it is quite within the ability of our millers to compete successfully, but when we already make such considerable shipments, and more than half of our exports of manufactured flour, to Great Britain and her West Indian dependencies, there is evidently good ground for hope that we may yet materially extend this trade in all countries where there is a demand for American wheat. Looking at the matter in this light, the late Millers' Exhibition had a national significance, as, in showing the advancement our mechanics had made in this branch of industry, it indicated the possibility of a still larger field for labor here, to be profitably employed in competition with European cheap labor only because of the improved machinery our millers have introduced.

To mention in detail all of the different kinds of machinery and appliances for milling and in its collateral branches shown at Cincinnati would fill a large proportion of this paper. Commencing with a large variety of turbine wheels and many improved patterns of engines, with all the appurtenances of shafting, gearing, etc., which belong to all manufacturing establishments where power is employed, the display comprised nearly everything used in the milling business in this country, together with much that is thought best of the machinery used in England, Germany, Austria, Switzerland, and France. There were many kinds of gradual reduction mills; smooth and corrugated roller mills in great variety; bolts, bolting cloths, and reels of widely differing patterns; scouring, cleaning, brushing, and heating machines; hand and power millstone dressers of many kinds; electric and other purifiers, etc.; and nearly all of the machinery was shown at work, the flour made affording samples from which bread was baked in one of the departments of the Exhibition. For the best flour made on the grounds the award went to an Indiana firm, but the most important exhibits of flour and grain were from the States of Ohio, Illinois, Iowa, Kansas, and Missouri, although great interest was shown in an exhibit of Hungarian flour, which, though excellent in quality, was thought to be decidedly inferior to many of the samples shown by our own millers. A gold medal which had been offered for the greatest improvement in milling in the last ten years was awarded to a Michigan firm for the middlings purifier; a premium for the best mixing and sifting machine went to Prussia, and for the best bolting cloth to Switzerland, while a Budapest firm in Hungary received an award for the best roller mill.

In short, the Exhibition presented a comprehensive epitome of about all that is now being done in the milling business, either at home or abroad, and, as the trade is now in a sort of transition state—the minds of millers being divided on questions of high or low grinding, gradual reduction, and new process methods—it cannot fail to have had a most decided influence, which will make itself apparent in the future of the business in this country. German and Austrian mechanics have, during the past few years, rather taken the lead of England in improvements in milling machinery, but there is nowhere else so great a variety of excellent appliances for the business, some of which are of acknowledged superiority, as American inventors and mechanics have brought forward and perfected for the use of our millers. It is this fact alone which accounts for the past increase in our exports of flour, and gives promise of our being able in the future to export the products of our wheat fields in the shape of flour to a much larger extent than we have hitherto done.

ARTESIAN WELLS IN CALIFORNIA.

The necessity of irrigation in Southern California, and the large area of land dependent solely upon flowing wells for water-supply, have led to a remarkable development of artesian wells, especially in the San Bernardino and Los Angeles basins. The main artesian belt is that running through the coast valley of Los Angeles where the number of wells approaches six hundred. The majority of these wells are in three clusters, adjacent to the rivers Los Angeles, San Gabriel, and Santa Ana, and around Compton, Artesia, and Westminster. The wells range in depth between 50 and 550 feet, the general depth being from 150 to 200 feet.

Some of the wells irrigate from 100 to 200 acres each, though a well which will irrigate 40 acres is considered a good one. According to the recent report of Assistant State Engineer, Jas. D. Schuyler, the first flowing well in Los Angeles County was bored by ex-Governor Downey, two and a half miles from Compton, in 1868. Since that time the general desire to secure by such means a constant supply of pure water has led to a rapid multiplication of wells, until now almost every farm-house in the belt rejoices in a spouting well. The pipes are usually carried two or three feet above the surface of the ground, and the clear water pouring over the top has the appearance of a dome of glass glittering in the sunlight.

In boring the first well it was found that the upper water-bearing stratum, 40 to 125 feet below the surface, was so largely composed of quicksand, which rapidly filled the pipes, that it was necessary to go deeper for a permanent supply. The second water-stratum was open to the same objection, though it yielded an abundance of water; and the third, though more gravelly, contained sand enough to be troublesome. To overcome these difficulties, and at the same time utilize the several water-bearing strata passed by the pipe, a contrivance was invented for slitting the casing. The slits, which are about six inches long, and so narrow as to exclude the sand, are made lengthwise and in groups of not more than three in any one section. If the water-bearing stratum is under forty feet in thickness, the pipe is perforated the whole distance, the bottom of the pipe always resting on an impervious stratum. In one well, eight miles south of the city of Los Angeles, the first water-bearing stratum was struck at 85 feet, and was 10 feet thick. The second occurred at a depth of 316 feet, and extended 17 feet, as far as the pipe could be pushed down, ending in coarse gravel. The force of the outpouring water brought out a bushel of gravel, the largest stone just filling the pipe and weighing four pounds. The head was sufficient to raise the water in a pipe 20 feet above the surface. In another well, sunk from the summit of a mound, near the sea coast, and 52 feet above the general level of the plain, surface water was found at a depth of 26 feet, and at 196 feet artesian water was struck, rising to within six feet of the surface. A remarkable natural artesian spring occurs on a high hill between Old and New San Gabriel Rivers. In a sag of the hill, perhaps eighty feet above the surrounding plain, is a springy marsh, from which water flows westward to the sea and eastward to the valley. The shallowest flowing well is 1½ miles west of Santa Ana, a few hundred yards from the river. It is but 44 feet deep, and yields a large discharge. Three hundred yards away a well was bored 300 feet without striking water. In the southern portion of the artesian belt, near Westminster, the water strata are at depths of 80 to 230 feet, the lower yielding the strongest flow.

It is found that as the number of wells is increased the flow of all is lessened, while some of those on the higher land have gone dry. The level to which the water will rise in the pipes steadily fell in Los Angeles County until two years ago, since which time it has slowly risen. The fall amounted to 6 feet, about 1½ feet having been restored. The diameter of the majority of Los Angeles County wells is 7 inches. The temperature of the water is about 62° Fah., with the exception of some deep wells at Pomona, which show 67° Fah., summer and winter.

The area of the Los Angeles belt is about 300 square miles. In San Bernardino County the area in which flowing wells are obtained is about 30 square miles. The topography and geology of the valley show very clearly that it was originally the bed of a lake, which has been filled up by the erosion of the surrounding hills. Most of the San Bernardino wells are for domestic use and garden irrigation, and are but two inches in diameter; some are as large as eight inches. The most northerly well is 262 feet in depth; the most southerly, which yields the finest flowing stream in the valley, is 99 feet deep. The average depth of fifty-six wells built by one firm is 160 feet, the range lying below 80 feet and 380 feet. The deepest well in the valley is furthest east, and has a depth of 410 feet, with a diameter of 7 inches. Vegetable matter, consisting of decayed tule roots and pine wood, was brought up from the last sixty feet. Small suckers, two to four inches in length and resembling the same fish as found in the mountain streams, were occasionally ejected from this well. This well afforded a fine flowing stream, but was spoiled in an attempt to perforate the pipe at 350 feet to secure the water of the first stratum. The incisions were made too close together; a strip of pipe was accidentally torn out, and the quick-sand rushed in faster than it could be pumped out. The pipe is now filled with sand and clay up to the level of the incision, shutting off the flow. The next well to this has a depth of 285 feet.

Gas Detection.

An ingenious instrument, termed a "spark tube," for indicating the presence of inflammable gases in mines, was lately exhibited and explained at the meeting of the Manchester Geological Society, by Dr. Angus Smith. The design of the instrument is taken from the old compression syringe used for igniting tinder, and the instrument consists of a small brass tube with glass let in at the bottom, which is closed up, and a piston and rod fitting closely in the tube. The air to be tested is taken into the tube either from the top or by means of a stop cock at the bottom, and the piston then rapidly pressed down with the hand, the compression of the air thus effected with the aid of spongy platinum causing the gases to explode inside the tube, the explosion being visible through the glass let in at the bottom. Dr. Smith stated that the presence of gas down to 2½ per cent could be detected by this instrument, and as the explosion within the tube was perfectly harmless, he thought the instrument might afford a useful means for exploring gaseous mines.

Remarkable Discovery of a Murder.

The following account of a murder which was committed in Bermuda in the autumn of 1878 is by the Attorney-General of the islands, Mr. S. Brownlow Gray:

"In the autumn of 1878 a man committed a terrible crime in Somerset, which was for some time involved in deep mystery. His wife, a handsome and decent mulatto woman, disappeared suddenly and entirely from sight, after going home from church on Sunday, October 20. Suspicion immediately fell upon the husband, a clever young fellow of about thirty, but no trace of the missing woman was left behind, and there seemed a strong probability that the crime would remain undetected. On Sunday, however, October 27, a week after the woman had disappeared, some Somerville boatmen looking out toward the sea, as is their custom, were struck by observing in the Long Bay Channel, the surface of which was ruffled by a slight breeze, a long streak of calm, such as, to use their own illustration, a cask of oil usually diffuses around it when in the water. The feverish anxiety about the missing woman suggested some strange connection between this singular calm and the mode of her disappearance. Two or three days after—why not sooner I cannot tell you—her brother and three other men went out to the spot where it was observed, and from which it had not disappeared since Sunday, and with a series of fish hooks ranged along a long line dragged the bottom of the channel, but at first without success. Shifting the position of the boat, they dragged a little further to windward, and presently the line was caught. With water glasses the men discovered that they had caught it in a skeleton which was held down by some heavy weight. They pulled on the line; something suddenly gave way, and up came the skeleton of the trunk, pelvis, and legs of a human body, from which almost every vestige of flesh had disappeared, but which, from the minute fragments remaining, and the terrible stench, had evidently not lain long in the water. The husband was a fisherman, and Long Bay Channel was a favorite fishing ground, and he calculated, truly enough, that the fish would very soon destroy all means of identification; but it never entered into his head that as they did so their ravages, combined with the process of decomposition, would set free the matter which was to write the traces of his crime on the surface of the water. The case seems to be an exceedingly interesting one; the calm is not mentioned in any book on medical jurisprudence that I have, and the doctors seem not to have had experience of such an occurrence. A diver went down and found a stone with a rope attached, by which the body had been held down, and also portions of the scalp and of the skin of the sole of the foot, and of clothing, by means of which the body was identified. The husband was found guilty and executed."

The Germination of Unripe Seeds.

Many instances have been put on record by different observers of unripe seed germinating, and several botanists have conducted extensive series of experiments in raising plants from seeds in different stages of development. At first sight it seems rather surprising that an imperfectly-formed embryo should grow into as vigorous a plant as a mature one; but, when we understand the general plan of growth in plants the phenomenon is intelligible. Thus, ferns actually develop from a single detached cell. This property of premature germination may be taken advantage of in practice in propagating plants that do not fully ripen their seeds in our climate. A rather longer period elapses before unripe seeds actually germinate, but frequently the progeny is equal to the best from mature seed. Formerly it was supposed that only ex-albuminous seeds would germinate when unripe, but M. Sagot, a Frenchman, succeeded in germinating green grain of wheat in which the albumen was soft, semi-liquid, and milky, and several other experimenters have raised different cereals from grain collected a fortnight to three weeks before the crops from which it was taken were ripe. Although the practice of sowing unripe seeds is not likely to become general, and would not be profitable under ordinary circumstances, it might be useful to know, in the case of a rare plant suddenly dying before its seeds were mature, that there was a possibility of their germinating, and thus preventing the loss of, may be, a valuable plant.

How a Water Moccasin Fishes.

A correspondent, writing from Plano, Texas, describes as follows the manner in which a mocassin used his body as a sort of sieve in catching small fish. His snakeship was in a shallow pool abounding in minnows, and was briskly twisting and turning in all directions, giving his body as many convolutions as possible to inclose the fish or force them into narrow spaces between him and the bank. In either case the fish would endeavor to escape by leaping over the snake's body into the water beyond. Meantime the moccasin with elevated head caught the fish in his mouth as they passed through the air.

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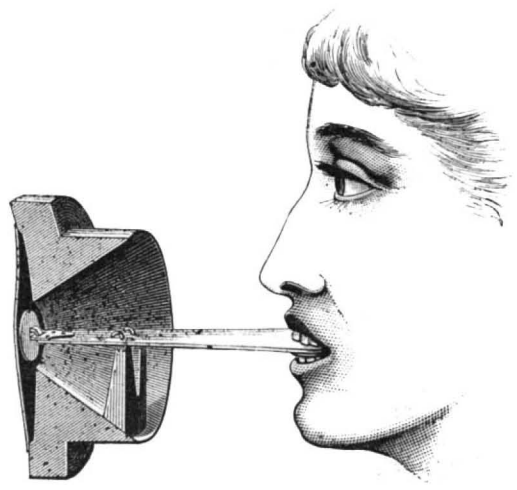
DENTAL ATTACHMENT FOR TELEPHONES.

The engraving shows a device to be attached to an ordinary receiving telephone for transmitting the vibrations of the diaphragm to the teeth, to enable deaf persons to hear conversation, music, etc.

The device may be readily detached so that the telephone may be used in the usual way. A link of rigid sound conducting substance, such as wood or hard rubber, is connected with the center of the diaphragm, or with a disk attached to the center of the diaphragm, and is supported by an elastic fulcrum attached to the mouthpiece of the telephone. The under surface of the link is provided with an elastic coating which prevents the vibrations from affecting the teeth of the lower jaw.

This device is applicable to either the electric, or the string, or acoustic telephone, and transmits the vibrations to the teeth and bones of the head, affecting the auditory



DENTAL ATTACHMENT FOR TELEPHONES.

nerves, and enabling persons having defective ears to hear. This device was lately patented by Mr. H. G. Fiske, of Springfield, Mass.

Canned Salmon by the Cargo.

The first cargo of canned salmon of this year's catch, from the Columbia River, was lately cleared from Portland, Oregon, for Liverpool, England. It comprised 56,756 cases, each containing four dozen one pound cans, or their equivalent. The gross weight was over 1,400 tons. Two other ships were soon to follow, both taking nearly full cargoes. Large consignments have also been received at San Francisco, for reshipment to England, Australia, and New York. The steamer Oregon, from Portland, June 25, brought 22,546 cases, the largest invoice of the season, if not the largest single shipment ever made to San Francisco from the Columbia River.

IMPROVEMENT IN SEWERS.

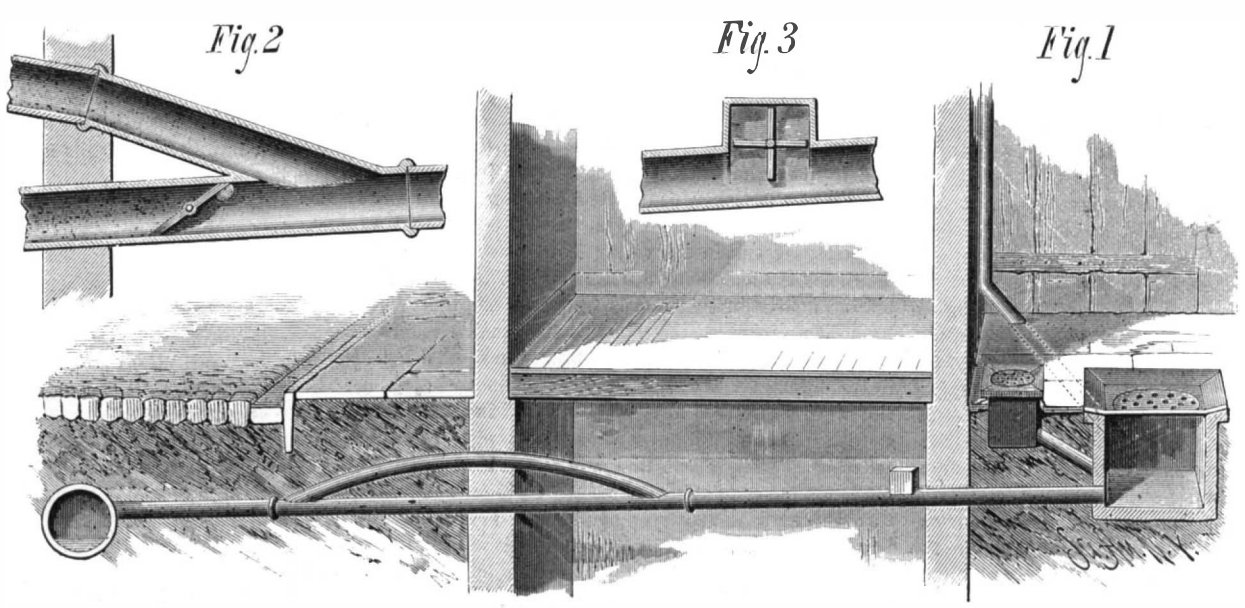
The engraving shows a device for preventing back flow of sewage in sewers, and for preventing noxious gases from being driven from sewers out into the air. The improvement consists in applying to the sewer a valve or gate provided with one or more floats, and a branch pipe running around the valve.

Fig. 1 in the engraving shows the arrangement of the sewer, and Fig. 2 is an enlarged view of the sewer and its branch. A short distance from the discharge end of the sewer there is a valve which swings on a horizontal axis running transversely through the sewer. The upper portion of the valve is provided with a float. Above the valve a branch pipe rises gradually to a height a little above high water mark, and then descends and discharges into the sewer beyond the valve. The branch may discharge into the river or into the main sewer, instead of returning, as shown in the engraving.

With this arrangement, when the outflow of sewage is obstructed by high water or otherwise, the back water having risen above the pivot of the valve, the float will rise, carrying the valve with it, closing it. The sewage will then rise and flow out through the branch. The engraving shows, in Fig. 3, a paddle wheel which may be applied to the sewer to increase the rapidity of the flow through the sewer, but the inventor has found that this is rarely needed.

The inventor states that bath tubs and water closets, where this improvement is applied, may be placed in the cellar without the slightest danger from floods, and we are informed that the device has been applied under trying conditions, and is working well, controlling the back flow and preventing flooding when, with the usual sewer provisions, a flood would be unavoidable.

This invention was recently patented by Mr. Charles Schirrmeister, of Brooklyn, E. D., and is being introduced by Mr. Alonzo Gaubert, 107 Broadway, Brooklyn, E. D., who should be addressed for further particulars.



SCHIRRMEISTER'S IMPROVEMENT IN SEWERS.

Death Rate of the Rich and the Poor.

An important paper on the comparative mortality of the rich and the poor was read at the recent meeting of the American Medical Association. The author, Dr. Charles Robert Drysdale, of London, began by pointing out the achievements of sanitary science during recent years. Yet, with all these advantages, it was found that the death rate in London had rather increased than diminished, having been 22·2 per 1,000 in 1856, 22·3 in 1876, and 23 in 1877. In all England the rate had remained identically the same for three decades, namely, 22·35 per 1,000. The point Dr. Drysdale endeavored to elucidate was, that the great cause of this non-improvement resided in the mass of indigence which, now as always, was instrumental in producing a large crop of premature deaths in all densely populated States. M. Villermé, the distinguished Parisian physician, and several of his able collaborators on the *Journal d'Hygiene Publique* had contributed some valuable facts to the argument. Thus, it had been observed in France that persons between the ages of 40 and 45 die, if in easy circumstances, in the proportion of 8·3 per 1,000, while, if poor, they died at the rate of 18·7 per 1·000. That is, the mortality between these ages was twice and a half as large among the poor as it was among the wealthy. It was found, too, that in Paris, between the years 1817 and 1836, 1 inhabitant in every 15 died in the Twelfth Arrondissement, which is peopled in great part by the poor; while in the Second Arrondissement, inhabited by the wealthier classes, the deaths for the same period were only 1 in every 65. M. Garnier, of Paris, in 1857, speaking of the mean life in a large English manufacturing city, had found that it was only 17 years in the quarters inhabited by the poor against 42 among the higher classes. Villermé calculated that the probable life of the infant of a weaver at Mulhouse was as low as 1 year and 6 months, while that of the baby of the proprietor of the factory was 26 years. Dr. Drysdale cited from a pamphlet written in 1877 upon the dwellings of the wages-receiving classes in Paris some further suggestive figures, from which it appeared that a death rate which was the mean of the whole population is always misleading. Thus, in part of a sub-district in London, comprising houses in good condition, the death rate did not exceed 11·3 in every 1,000, while there were adjacent dwellings in the same sub-district in which the death rate had risen to 38 per 1,000; and it was now reported that there were particular districts in London where the death rate was 50 per 1,000. On the other hand, the average death rate of the whole population was only 24 per 1,000 in 1843, and had scarcely deviated from that figure since. If such statistics were insufficient, he would refer to the researches of Ansell, who collected the statistics of 48,044 children of the opulent classes in England, including professional men, the nobility, and gentry. It appeared from Ansell's tables that, among these classes, the death ratio was only 80·45 per 1,000 for children under a year old, while for all classes taken together it was 150. Dr. Little found the ratio in Berlin, a city of extreme poverty among the working classes, to be occasionally as high as 500 per 1,000. In conclusion, Dr. Drysdale referred to the statistics of New Zealand as a remarkable confirmation of Ansell's tables. In New Zealand, of late years, the wages of laborers had been very high, and the profits of capital large, with meat only 3d. a pound, so that a laborer was able to secure plenty of food without undue anxiety. The result was a death rate of only 12·5 per 1,000—a fact mainly due to the absence of an indigent and badly paid class. In England and Wales, with the same death rate, some 230,000 lives would be saved every year. In passing, Dr. Drysdale took occasion to dissent from the view that alcohol is the great cause of evils in modern states. It was probable that a New Zealand laborer did not drink less beer than he did before he left England, and yet he lived nearly twice as long in New Zealand as he could expect to live at home.

NOVEL CAN OPENER.

The can opener shown in the engraving consists of a curved blade, having its cutting edge tapered or inclined backward obliquely on each side of the penetrating point. This blade is secured in an annular groove in the handle by a pin passing through the handle and through slots in the blade.

The handle has two or more annular grooves into which the blade may be sprung and fastened to adapt it to cans of different sizes.

The method of using this instrument is obvious. The penetrating point is forced through the top of the can near

BROCK'S CAN OPENER.

one side; the blade is then pushed down, making a shearing cut and cutting out a circular portion of the can cover.

This invention was recently patented by Mr. W. E. Brock, of New York city.

NEW INVENTIONS.

Mr. Jules Lambert, of New York city, has patented an improved flitter for milliners' trimmings that is ornamental, and serves also to attach other ornaments, such as beads, bugles, etc., to feathers and other articles of dress.

An improved heater or steam generator for open grate fireplaces has been patented by Mr. Issac B. Potts, of Columbus, Ohio. It is designed that this heater or steam generator shall be placed in an open fireplace, with its pipes forming or lining the back and sides of the fireplace, and with upward inclined pipes forming or lining the lower slope of the chimney flue.

An improved car coupling has been patented by Mr. John F. Stanley, of Chaplin, Ky. The object of this invention is to furnish car couplings so constructed that they will couple automatically when the cars are run together, can be easily uncoupled, and will not be liable to become uncoupled accidentally.

Mr. James R. Thomas, of Calpella, Cal., has patented an improvement in eyes for securing hoe blades and other tools to handles, so constructed that the blades or tools will be held firmly in place and may be detached and exchanged when desired.

A telescopic or extension pedestal, to be used as an accessory in forming photographic backgrounds, and so constructed that it may be extended and lowered as the height of the person to be photographed or the character of the pose may require, has been patented by Mr. William F. Ashe, of New York city.

Mr. John Collins, of Brooklyn, N. Y., has recently patented an improved apparatus for generating gas for soda water. The object of this invention is to render the operation of gas generating continuous or intermittent, as may be desired, without removing the charge of carbonate or acid until it is entirely exhausted. The device which controls the supply of acid to the carbonate is entirely automatic after being once set in operation, the gas pressure controlling the flow of acid. The mechanical devices by which this invention is carried out cannot be readily described without engravings.

A new tree protector, for protecting trees from grubs and insects, has been patented by Mr. Joseph W. Richards, of Lynn, Mass. It is simple and effective.

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An improvement in commodes has been patented by Mr. Andrew Climie, of Ann Arbor, Mich. The object of the invention is to prevent the unpleasant odor arising from a water closet, especially such as are used in railway cars, and to inclose the deposits and convey them away.

An improved nail for the soles of shoes, so formed that after being driven and having its head removed the nail will have a four pronged appearance, has been patented by Mr. Zephaniah Talbot, of Holliston, Mass.

An improved refrigerating and ice making apparatus has recently been patented by Mr. Charles P. G. Linde, of Munich, Germany. The improvements relate to that class of refrigerating or ice making apparatuses in which the refrigerating effect is obtained by the evaporation of a volatile liquid, the vapors of which are compressed by a pump into a condenser, and then liquefied ready to be again subjected to the process of evaporation. The object of this invention is, first, to prevent overheating of the pump; second, to effect a more perfect packing of the stuffing box of the pump, and the employment of the stuffing medium for the lubrication of the points of contact of the working parts; third, to provide means for replenishing the apparatus with pure liquid ammonia while in operation; fourth, to provide means for the production of transparent ice and the means for discharging the same from the carriers.

Mr. Samuel A. Bollinger, of Patterson, O., has invented a harrow so constructed that either side or the whole harrow can be raised from the ground to clear it from rubbish and to pass roots, grass, and other obstructions.

AN IMPROVED HARVESTER.

Although the general principle of the reaper shown in the engraving is common to many machines of this class, the particular machine illustrated embodies several novel improvements of considerable merit which render it superior. The machine is constructed throughout with a view to convenience in handling, to strength and durability, and at the same time the new features render it very efficient.

The frame containing the running gear is composed of two iron end pieces and two wrought iron side pieces, secured together by bolts or rivets. The outer side piece supports an adjustable slide, to which is attached the seat spring, thus making the seat adjustable, so that the driver may move it either backward or forward to balance the machine and relieve the necks of the horses from undue weight.

The inner side piece of the main frame carries an adjustable foot piece which forms a guide for a vertical bar, the lower end of which is jointed to the side bar of the platform or table. On the upper end of the vertical bar there is a hand lever, which is connected by a rod with the side bar of the platform, a short distance back of the vertical bar, so that by moving the lever the platform may easily be tipped one way or the other as may be required. The lever is provided with a bolt or latch, which retains it in any desired position by falling into one of several notches in a sector secured to the top of the vertical bar.

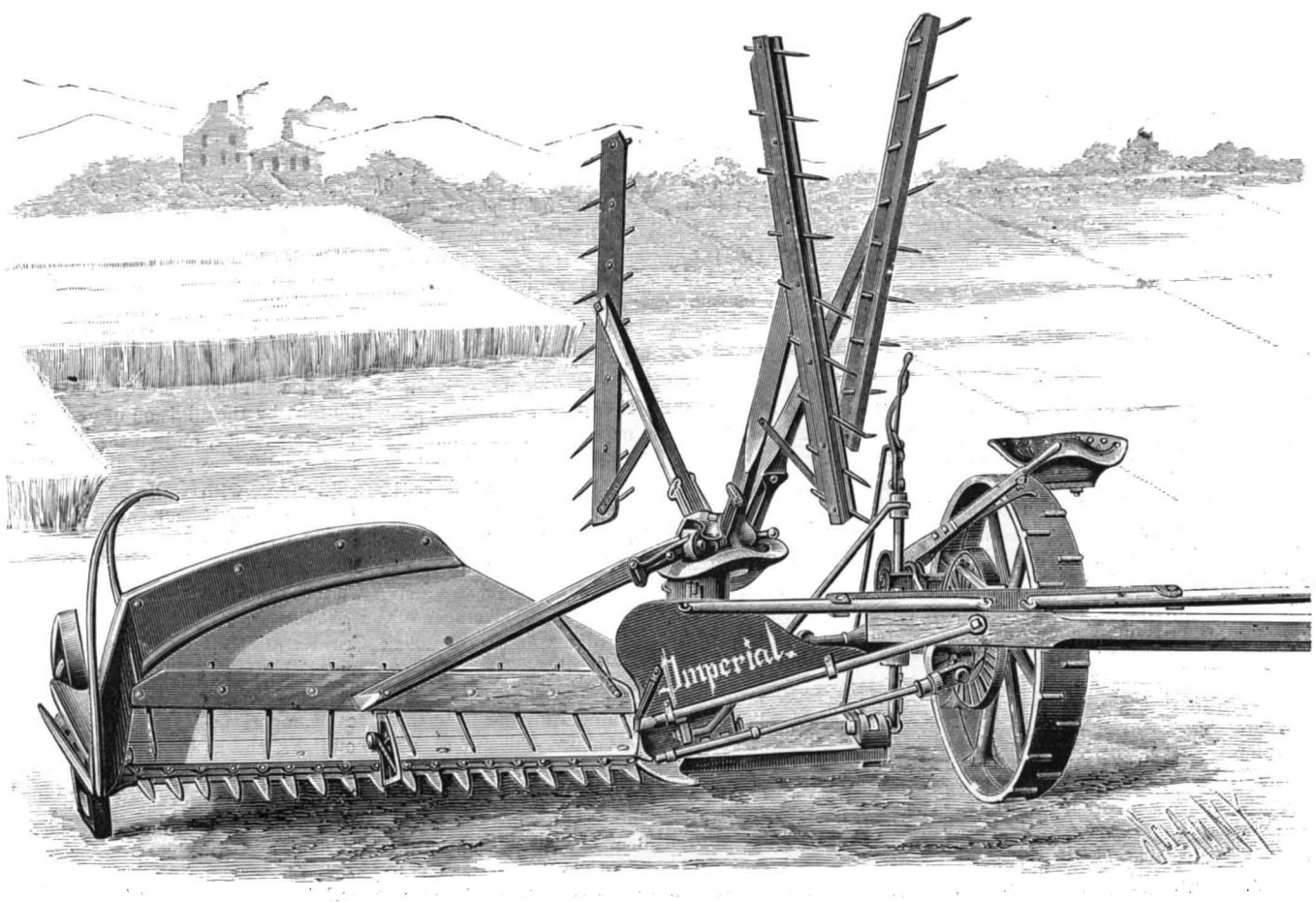
Upon the foot piece which guides the vertical bar there is a ratchet and chain wheel for winding a chain connected with the inner end of the platform. A lever carrying a pawl is adapted to work the ratchet wheel so as to raise or lower the inner end of the platform by winding or unwinding the chain. A holding pawl is provided for retaining the ratchet wheel in any desired position.

The crank shaft and gearing intermediate between it and the axle are supported by journal boxes attached to the main frame. Side draught is avoided by attaching the tongue to the inner side of the frame. The automatic rake is of a well known type, which will be recognized by those of our readers familiar with agricultural machines.

The appearance of this machine is trim and workmanlike, and it seems well adapted to the work for which it is designed.

The adjustments, which are calculated to meet every requirement, are all easily made. The working parts are of wrought and cast iron and steel.

This machine is made by Messrs. Crawford & Co., at their Globe Agricultural Works, London, Ontario, Canada. The name given the machine is "The Imperial Harvester."

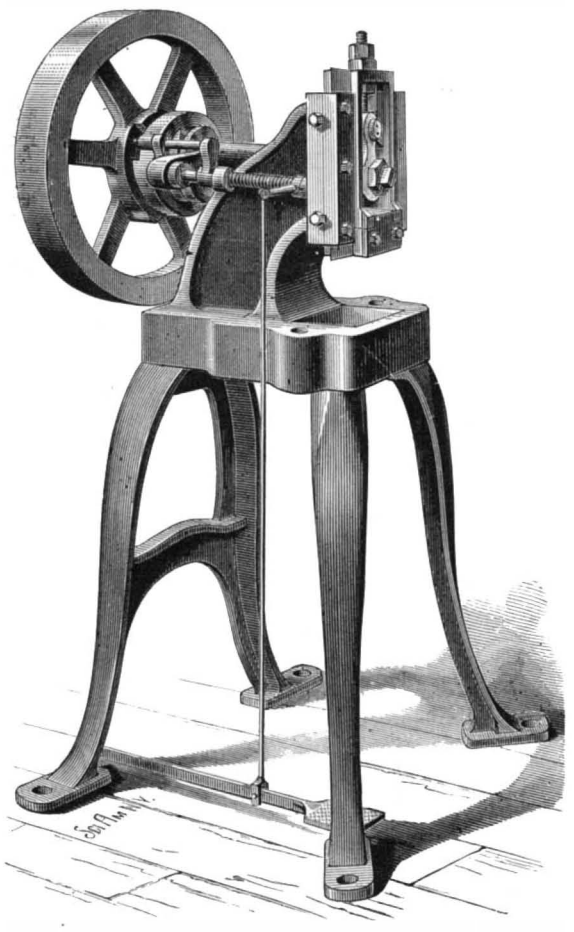


THE "IMPERIAL HARVESTER."—MADE BY CRAWFORD & CO. LONDON, ONTARIO CANADA.

A NEW PUNCHING PRESS.

The Peerless Punch and Shear Company, 52 Dey street. New York, have just completed a new power press for punching sheet and bar metals, similar in design to their No. 1 foot press, of which we published illustrations in September last, excepting that the treadle and pendulum are replaced by a balance wheel for belt power.

One of these presses, although weighing but 500 lb., will punch a ½ inch hole in ¼ inch iron, or 1 inch hole in ⅛ inch iron, and will cut a blank 6½ inches square from No. 14 iron or brass. If used as a shear, it will cut bar iron 2 inches by ¼ inch in thickness, or ⅝ inch round.



PEERLESS POWER PRESS No. 1.

The wheel is 22 inches diameter and weighs 130 lb. The design embodies great strength, while the press occupies floor space only 2 feet 3 inches by 2 feet 11 inches. Many of this style of presses are sold with a pendulum attachment to be worked by foot power when steam is not available. This is a great convenience, as the operator is not altogether dependent upon steam power, and can use his press at any time by merely taking off the balance wheel and putting on the pendulum in its place.

Covington, Iowa, Threatened.

In several instances thriving towns on the treacherous banks of the Mississippi and the Missouri rivers have been wiped out by the erosion of the river banks. Covington, Iowa, according to the Sioux City *Journal*, is another doomed city. It stands on a bend of the Missouri River, where the banks are being gradually eaten away. Many feet of fast flowing water now sweep over the spot where the court house stood a year ago. Recently the current set in shore and took off a strip of land thirty feet wide in a few hours. No invasions were made for another week, when another slice was cut off. Then about half a dozen buildings were moved back about some thirty feet, and the next day the land on which they had stood was all gone. The citizens have tried to moor trees and logs to the bank in the hope of forming a barrier for the flood, but the current is so swift and the water so deep that these attempts have failed. To give an idea of what the town of Covington has suffered in the past five years, the case of the ferry house and the principal hotel may be instanced. Two years ago there were six hundred and sixty feet of land between the building and the river bank; now you can toss a stone out of the hotel window into the river, and buildings are now being put on rollers for removal.

Hatching Spanish Mackerel.

Professor Earle, of the United States Fish Commission, has discovered that Spanish mackerel can be hatched artificially, and that its capacity of reproduction is many times that of the cod or the shad. Professor Earle received his first hint in regard to Spanish mackerel from Chesapeake fishermen, who reported that large numbers of them annually frequented the inland waters near Chrisfield, Md., and Mob Jack Bay. On being directed by Professor Baird to make experiments there with hatching apparatus, Professor Earle was surprised to find that the fish were hatched within eighteen hours from the time the milk and spawn were brought together. It requires five days to hatch shad, and from eight to twelve days to hatch cod. The number of eggs operated upon at a single hatching was between 200,000 and 300,000, while of shad only about 20,000 to 30,000 can be turned out at once.

Another fact of importance is that the season for operations with the spawn of the Spanish mackerel is toward the last of June and first of July, after the shad season is over, and before that of cod begins. It is estimated that the number of young fish "turned out" this season will be more than a hundred million.

How Mr. Hannay Made his Diamonds.

Mr. G. B. Hannay, in a recent number of the "Proceedings before the Royal Society," gives an interesting account of the method employed by him in starting and prosecuting his experiments in making diamonds. And if only as a record of indomitable perseverance against ever-increasing difficulties, of scientific acumen, and of the true application of the Baconian method of research, as the London *News* justly says, it is worthy of study. Some idea of the nature of the investigation may be obtained from the fact that out of complex and expensive experiments only three succeeded. Violent explosions were frequent; furnaces were blown to pieces; steel tubes burst, scattering their fragments around. On other occasions, tubes which had been carefully prepared, filled, welded, and nestled in a reverberatory furnace for many hours, were found to have leaked and spoiled the experiment. "The continued strain on the nerves," writes Mr. Hannay, "watching the temperature of the furnace, and in a state of tension in case of an explosion, induce a nervous state which is extremely weakening, and when the explosion occurs it sometimes shakes one so severely that sickness supervenes." The diamond-making experiments were started in September, 1879, when Mr. Hannay made many attempts to find a solvent for the alkali metal, sodium, potassium, and lithium. But in no instance could such a solvent be found which did not, in the gaseous state, and under pressure,

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unite with the alkali. Even in the case of hydrocarbons, such as paraffine spirit, containing only hydrogen and carbon, the alkali combined with the hydrogen, setting free the carbon. Now, as we know, diamond is pure carbon; hence, when this element was set free from a pure substance, it was thought that conditions of pressure and temperature might eliminate it in the hard, crystalline, adamantine form, namely, as diamond. Glass tubes were first employed, but, although of great thickness in comparison with their bore, they were found to be insufficiently strong, and they were replaced by wrought iron tubes twenty inches long by one inch diameter, and having the diameter of the bore half an inch. In these lithium was heated for many hours to a high temperature in paraffine spirits, and on subsequently opening the tube carbon in a hard form was found within it. Great difficulty was experienced in getting the tubes perfectly airtight, and eventually the open end was welded at a white heat, and by that means alone did it resist leakage. Sometimes tubes would burst with an explosion like a gun. A tube twenty inches long by two and three quarters diameter and one half inch bore was filled with a hydrocarbon made from bone oil, to which some charcoal powder was added in order to keep an excess of carbon in the tube. Its open end was welded, and it was heated for fourteen hours with lithium. On opening it a quantity of gas appeared and some minute pieces of hard carbon which had evidently separated out from solution. Another similar tube burst at the end of eight hours' heating. A tube of cast iron, no less than three and three quarter inches diameter, and with a bore of only three quarters of an inch, exploded at the end of an hour with a fearful report, wrecking the furnace. Several tubes of steel also burst under the enormous pressure, at last shattering the top of the furnace. The author remarks that in nature the temperature must at one time have been much higher than anything we can now produce artificially; while the pressure obtained at a depth of two hundred miles below the earth's surface is greater than that which any of the materials from which we can form vessels can resist.

We come now to the great experiment which resulted in the artificial production of veritable diamonds. A tube twenty inches long by four inches diameter, of coiled Low-moor iron, was bored so as to have an internal diameter of half an inch. Thus the central bore was surrounded by walls of iron one and three quarter inches thick, and, of course, capable of resisting an enormous pressure. In the tube was placed a mixture of ninety per cent of bone oil and ten per cent of paraffine spirit, together with four grammes (about sixty-two grains) of the metal lithium. The open end of the tube was welded airtight and the whole was then heated to redness for fourteen hours, and allowed to cool slowly. On opening it a great volume of gas rushed from the tube, and within was found a hard, smooth mass adhering to the sides of the tube. "It was quite black, and was removed with a chisel, and as it appeared to be composed principally of iron and lithium, it was laid aside for analysis. I was pulverizing it in a mortar, when I felt that some parts of the material were extremely hard—not resisting a blow, but hard otherwise. On looking closer I saw that these were most transparent pieces embedded in the hard matrix, and on triturating them I obtained some free from the black matter. They turned out to be crystalline carbon, exactly like diamond."

Such is Mr. Hannay's account of his discovery. Subsequent chemical and optical analysis has proved that these hard shining crystals are, in every respect, true diamonds. The cost is obviously great; so, also, is the danger to life and property; and the great difficulties to be overcome render disappointments common. What we now want is to get vessels of a material sufficiently strong and non-porous to resist the high pressures and temperatures upon which the success of the experiment depends. What we have learned, among other things, from the brilliant researches of MM. Cailletet and Pictet, which led to the liquefaction of the so-called permanent gases, and from Mr. Hannay's experiments, described above, is, that we must push the forces of nature to their utmost strain by using our most powerful mechanical devices for producing pressure, our strongest materials for resisting it, and our intensest means of producing both heat and cold.

The High Buildings of the World.

The crown of the hat of the statue of William Penn, which is to surmount the tower of the new public buildings of Philadelphia, will be just 535 feet above the pavement. This is 10 feet 1 inch higher than the highest towers of the Cologne Cathedral as they now stand. The Penn Square tower, however, will ultimately be overtopped by the Cologne towers 41 feet 9 inches, their intended height being 576 feet 9 inches. The heights of the other chief lofty buildings of the world are given as follows:

Tower of St. Nicholas' Church, at Hamburg, 473 feet 1 inch; cupola of St. Peter's, Rome, 469 feet 2 inches; cathedral spire at Strassburg, 465 feet 11 inches; pyramid of Cheops, 449 feet 5 inches; tower of St. Stephen's, Vienna, 443 feet 10 inches; tower of St. Martin's, Landshut, 434 feet 8 inches; cathedral spire at Freiburg, 410 feet 1 inch; cathedral of Antwerp, 404 feet 10 inches; cathedral of Florence, 390 feet 5 inches; St. Paul's, London, 365 feet 1 inch; ridge tiles of Cologne Cathedral, 360 feet 3 inches; cathedral tower at Magdeburg, 339 feet 11 inches; tower of the new Votive church, at Vienna, 314 feet 11 inches; tower of the Rath-haus, at Berlin, 288 feet 8 inches; Trinity Church, New York city, 284 feet; and the towers of Notre Dame, at Paris, 232 feet, 11 inches.

AMERICAN INDUSTRIES.—No. 52.

WINE MAKING.

To have styled this branch of business an *American* industry a few years since would have provoked a smile. Now, however, it is becoming generally understood that the productions of American vineyards are affording the means by which the home demand may be supplied, and that in some cases American wines have won an enviable distinction in comparison with those of the most noted wine-producing countries of the world. The long established prejudices in favor of wines which have a foreign trade mark and an unreadable label are not, it is true, entirely removed; it will probably be many years before it will cease to be "fashionable" to give undue credit to wines that are imported, simply because they *are* imported; but the good work in this direction which has been already accomplished by the Urbana Wine Company, of Hammondsport, N. Y., gives promise of a future development of wine making in this country that cannot fail to make the business one of considerable importance among our industries. In foreign wines adulterations, often injurious to health, are so common that it is difficult to obtain a pure article, and many, among those who are not connoisseurs, have never had an opportunity to taste a pure wine. For this reason, more than any other, the establishment of the wine making industry here, in such way that all may assure themselves of the absolute purity of the wine they buy, becomes a matter of particular moment, and the engravings we give on the first page of this paper, illustrative of the location and works of the Urbana Wine Company, will undoubtedly attract the attention which a subject of such direct interest to almost every one deserves.

The first requisite in the making of a superior wine is to have the best quality and fine varieties of rich, ripe grapes. These are not grown to any great extent anywhere in the world except between the 35th and 55th degrees of north latitude. In climates more northerly the grape seldom arrives at full maturity, and the wines are weak, liable to sour, and destitute of the generous flavor which characterizes those produced from grapes grown further south; if we go further south than the 35th degree, however, there is too decided a predominance of the saccharine matter, and a perfect vinous fermentation cannot be effected. The location of the vineyards of the Urbana Wine Company, on the shores of Lake Keuka, or Crooked Lake, Steuben County, N. Y., combines all the advantages of the finest grape-growing regions of the world. The soil is a gravel on calcareous rock; the ground is undulating and even precipitous, with a general southeast exposure toward the lake, which tempers the summer breezes and gives that atmospheric equability best calculated to insure the perfect ripening of the grape. The location has been styled the Rheims of America, and has been famous for its grape production for many years, though it was not until about 1860 that this was made a regular business. Now, however, the vineyards here cover some ten thousand acres, in the heart of which, and immediately on the banks of the lake, affording ready means of cheap transportation, are the works of the Urbana Wine Company.

The principal varieties of grapes cultivated are the Catawba, Isabella, Delaware, Iona, Walter, and Concord, and it is the proper selection and combining of the fermented juices of these grapes, under conditions which are carefully regulated, that makes the various still and sparkling wines for which the company have obtained so wide a reputation. They use absolutely nothing else but these grapes, except the necessary quantity of pure sugar, so that they make no bogus or carbonized wines, the gas in the champagne being a natural product of fermentation in the bottle, and not an artificial gas injected in the wine by a machine, as is the case with some of the wines now made.

Referring to our engraving, the main building of the company's works is a very substantial stone structure, 150 feet long by 60 feet wide, with wings extending on either side, the ground floor of the whole being entirely taken up by capacious vaults, the walls of which are so thick and solid that the temperature there in summer weather never rises above 60°. The grapes, as they are brought in, principally by steamers, sloops, and flatboats from the vineyards on the lake, are first taken to the third story or top floor of the establishment, where they are carefully assorted, and all imperfect or decayed fruit removed. They are then run through mills especially designed for breaking the skins without crushing the seed, and it is the juice derived from this first operation from which the highest quality of champagne is made. From here the grapes go to the press room, an illustration of which may be seen in one of our views. There are several large presses here, where two or three workmen, with powerful leverage, subject the grapes to sufficient pressure to thoroughly extract all the juice, which is conveyed through rubber hose to large casks below, where the first fermentation takes place. For a perfect vinous fermentation the temperature has to be carefully regulated. Below fifty degrees it proceeds very slowly, and above seventy degrees it would be too rapid, with danger of passing into the acetous stage. As the fermentation proceeds the temperature of the liquor rises, it has a turbid appearance, and gives off carbonic acid gas. At length this commotion gradually diminishes, and the liquor recovers its transparency, when it is found to have exchanged its sweet taste for one of considerable pungency, and to have acquired the property of acting as a powerful stimulant on the animal system. After this first fermentation the wine is racked off into other and clean casks to remove from it all sediment or impurities, and it is now in the proper condition to combine in various ways the product of different kinds of grapes for making still wines, or for the subsequent processes necessary to make champagne.

In the selecting of the different grape products which will so blend as to give the best effects as regards spirit, flavor, acidity, etc., both in champagne and still wines, great care and experience are necessary. The proper combination being decided upon, the wine is bottled accordingly, as shown in the "bottling" room. This is done by the aid of an automatic bottle filler, the corks being held by a metallic fastening styled an agraff, always used in first corking, and the filled bottles are then piled up to await the second fermentation. The department in which this takes place should be kept at an even temperature, and for this purpose it is fitted up with steam pipes. The air being of the required warmth causes a second fermentation in the bottle, and this produces the carbonic acid gas which makes the sparkle; absolutely nothing else but this natural product of the grape being used to make the life and effervescence of the wines of the Urbana Company. As the process approaches completion it is marked by the frequent breakage of bottles, which are burst by the gas produced in them by the fermentation, about 5 per cent of all the wine made being lost in this way. In France and other wine-producing countries the natural heat of the atmosphere is depended upon to effect the fermentation, so that when the weather is exceptionally cool during the wine-making months the operation proceeds in a very tardy and uncertain way, while here it goes on as regularly as clockwork, and the results can be definitely calculated upon, although there is no difference in principle between the methods followed by this company and those in use by the best French wine manufacturers.

When the second fermentation has been completed the bottles are lowered into cool vaults, where they are allowed to quietly rest and mature for two years. When wanted for use the bottles are placed on sediment racks, necks downward, workmen passing through and shaking them gently twice a day for three or four weeks. In this way any sediment which has been produced by the fermentation is gradually worked down on the cork in the neck of the bottle. From here the bottles go to the finishing room, which is shown in the large view at the bottom of the page. Here the cork is removed by an expert, and as it flies out carries with it a small quantity of champagne and the sediment which had settled there. It is then passed to a "doser," who, with a small machine, injects a sirup made of white sugar candy dissolved in champagne. The quantity so injected is very small, but care is taken that the contents of each bottle shall be exactly the same. The bottle next goes to the corker, who, with the aid of a machine, closes it with a large cork, after which come the tying and wiring, all of the operations, however, being conducted in much less time than it takes to describe them. The bottle is now well shaken, to mix the sirup thoroughly with the wine, and then comes the labeling, putting on the foil, wrapping, packing, etc.

In the manufacture of sweet and dry Catawba, port, etc., particular care is taken in all the processes and in putting up the wine to make an article which will keep in every climate. The Catawba is a heavy, fine-flavored wine, and to a large extent takes the place of imported hocks. The port wine made by the company is from several varieties of grapes fermented on the skins, which gives it a heavy dark color. One of our sketches gives a view of one of the large vaults, where, in immense casks of about 3,000 gallons capacity each, the still wines are kept until they have been properly matured and mellowed.

The vaults and building of the Urbana Wine Company, originally the largest in this country, were last summer greatly increased, giving to the establishment quite double its former capacity. The entire new vaults, under the new stone south wing, are 80x40, with artificial ice houses behind the lower walls, capable of reducing the temperature if desired. These are wholly devoted to champagne manuture. The fermentation room above them is 80x40, fitted with steam boiler and works, controlling the temperature at any desired point, and is claimed to be the most complete fermenting room in any wine-making establishment in America. The storage capacity for wine was also nearly doubled by the addition of casks. Above this are the new finishing rooms, and on the floor above the store and rooms where grapes are received. These buildings are made of solid stone, with walls of great thickness. The crop last fall was exceptionally prolific and very superior in quality, and the company decided to put in a very large stock. More than twice the amount of grapes ever before purchased were crushed last autumn by this company.

At the late Paris Exhibition the "Gold Seal" and "Gold Seal Extra Dry" champagnes of the Urbana Wine Company were exhibited in direct comparison with the best champagnes of France. This was the first time there had been a real comparison between the champagnes of the different countries, and as a result these wines were awarded a medal. At our Centennial in 1876 the "Gold Seal" and "Gold Seal Extra Dry" were awarded the highest honors, obtaining two medals and two diplomas.

The officers of the company are: D. M. Hildreth, President; Clark Bell, Vice-President; H. H. Cook, Treasurer; and A. Smedberg, Secretary. A. J. Switzer, Hammondsport, N. Y., is the General Superintendent.

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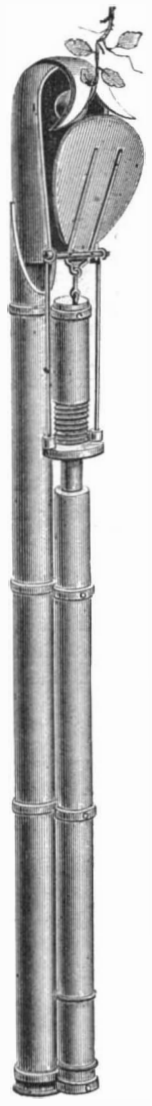
Hints for Preserving Fruits.

A useful hint to cooks was given at a recent sanitary convention in Grand Rapids, Michigan. It was pointed out that by adding sugar to sour fruits, during the cooking process, the greater part of the cane sugar was converted by the aid of the acid into grape sugar, which does not possess half the sweetening power. By cooking the fruit first, and then adding the sugar to an agreeable sweetness, a very great deal of sugar might be saved.

Raspberry, strawberry, and cherry sirups of the German Pharmacopœia have to be made by bruising the fruit and letting the marc and juice ferment, after which the juice is strained off and filtered. A better and safer way is to add at once to the freshly bruised fruits five to six per cent of alcohol, to let the whole stand for some days, decant and filter. Lastly, boil up once to remove the greater part of the alcohol. Sirups made with juice prepared as above retain in a remarkable degree the odor and taste of the fresh fruits.

NOVEL FRUIT GATHERER.

The annexed engraving shows a convenient implement for gathering apples, pears, peaches, and other fruit without bruising it. The cup that receives the fruit is movable on the upper end of the rod, and is provided with a forked hook which grasps the stem of the fruit. A cover is hinged to the cup and connected with the rod, so that when the cup is pulled downward in the act of fruit picking, the cover closes and guides the fruit, so that it falls into a rubber tube connected with the lower part of the cup. After the fruit stem has been removed, the spring on the rod returns the parts to their former position.



Jarman's Fruit Gatherer.

This fruit gatherer was recently patented by Mr. J. N. Jarman, of Peacher's Mills, Tenn.

Sapphires in Siam.

Five years ago a native hunter in Siam found sapphires in a remote and secluded district. Some men who were let into the secret followed him to the mines and brought back to Rangoon and Calcutta a number of very valuable stones. A rush ensued from British Burmah, thousands of adventurers flocking to the mines, some to find sudden fortune, but more to lose their lives from privation and jungle fever.

The mines occur in the provinces of Battambong and Chantaboon. In his commercial report for 1879 the British consul at Bangkok says that the miners are very careful to conceal their gems while in Siam. Being anxious to show some of the gems to Admiral Coote, the consul called for specimens from some miners who had just returned from the diggings. One miner, a poorly clad and miserable looking fellow, produced a few small stones, and after a great deal of coaxing was induced, with many precautions, to give a private view of his great prize, which was a very large sapphire in the rough, valued at $10,000. He would probably not have shown this stone at all had he not been on the point of leaving in a steamer. Owing to the secrecy thus observed by the possessors of valuable gems, it is impossible to give any estimate of the total value of stones found, but that individuals have made very large profits is certain. One man dug out a stone which he offered for sale in Chantaboon at $500, but did not find a purchaser. He went with it to Rangoon, where he was offered $7,500; but, having awoke to the value of the stone, he declined to sell and took it to Calcutta, where he eventually obtained $15,000 for it. Now, however, there are many experienced gem merchants established in the neighborhood of the mines, and something like the real value of the stones can be obtained by the miners on the spot. The largest sapphire hitherto found, so far as the consul knows, weighed 370 carats in the rough, and when cut turned out 111 carats of the finest water. The ruby, onyx, and jade are also found in the district, but the quality of none of these is such as to make them very valuable.

Pyrethrum for Grain Weevils.

Adjacent to my office is a warehouse filled with wheat. This spring the grain weevils therein commenced to migrate, and infested my premises. We therefore sprinkled some buhach, or insect powder, over the grain, and swept the weevils up literally by the quart. Those which emigrated to my office were also treated with a sprinkling, and it cut short their earthly career. . . .

I am convinced that a judicious use of this powder on board each grain ship would save an immense amount of loss. I have seen it used in one of the largest mills in the State, and it brought cockroaches out in quantities which astonished even the miller, who little thought he had so many on his premises. A clergyman, a friend of mine, who cannot sleep if a mosquito is within a mile of him, tells me he has only to put a little powder on some burning paper in his room, and there is "perfect peace."—*A. T. Elliott, in American Entomologist.*

Bogus Sugar.

The manufacture and great profits which the makers of glucose are now realizing are described in the following testimony lately given by one of the original producers, in a law suit at Buffalo, N. Y. It would appear from the evidence that the public rather prefers to be cheated, and will pay more for sugar that is not sweet than for the genuine article.

Mr. Horace Williams testified as follows:

"The manufacture of grape sugar from corn was commenced originally by witness and his partner. He invented some of the machinery by which the process was brought to perfection. He obtained patents in order to keep his process a secret. Their firm name was then A. W. Fox & Co. They commenced with two or three hundred bushels a day, and increased this amount gradually to two thousand. This was the amount in 1874. The Buffalo Grape Sugar Company was then organized. There were 200 shares, of which Fox owned 102; witness owned 60 shares, and the balance was held by William Hamlin. Improvements have since been made in the machinery, by which a better article of sugar is made and with greater facility. They first produced crude sugar—used in the manufacture of ale and lager beer, principally ale. The sugar was used in place of malt. At a later date they refined the sugar. Grape sugar also was used, in 1874, by tobacconists. As its quality was improved it was used in other branches of business. A large quantity is now used in making sirups for table use. Witness knew there was very little pure cane sirup sold now. The grape-sugar sirup is more wholesome and delicious. Glucose and grape sugar are one and the same thing—glucose being the sugar in a liquid form. When it is called grape sugar it is in a solid form. This is being used considerably in New York in making sugar, making what is called improved sugar. Witness understood that the Buffalo Grape Sugar Company was interested in this mixing of sugars in New York. At the present time the demand for grape sugar exceeds the supply, and the price of it has increased. In 1874 thirty pounds of sugar were made from one bushel or fifty-six pounds of corn. The price was then from 3½ to 4, and sometimes 4½ cents a pound. The refuse is sold for feed, and the price of it was from seven to eight cents a bushel. In mixing sugar the grape sugar is pulverized, and about twenty-five per cent. added to cane sugar. It improves the color of the sugar, and enables dealers to sell it for a better price.

During 1874 and 1875 the earnings were about $15,000 a month, and in 1876 they averaged from $19,000 to $20,000. In 1877 the earnings for one month were $35,000. Witness did not see many of the statements during 1878. A starch factory was run in connection with the sugar works, about 500 bushels of corn being used in a day. Witness did not know much about the earnings of the starch factory. He was aware that the business was profitable. He understood all of the processes of the establishment, and had charge of the manufacturing of the sugar, glucose, etc. He made estimates from time to time of the cost of turning a bushel of corn into sugar, and in doing so took into consideration the outlays, cost of machinery, building, etc. He estimated it to be about 25 cents a bushel, and the net profit of a bushel of corn, at 45 cents a bushel, when turned into sugar, to be 70 cents. A number of small manufactories have sprung up in this country, but there are only four or five of any account. The amount of corn consumed in 1879 was from 4,000 to 6,000 bushels a day. In some respects it costs less per bushel to run a large amount of corn than it would to consume a small quantity. The net profit per bushel from 1874 to 1879 was from 40 to 50 cents.

Composite Diamonds.

A diamond expert of Chicago asserts that many of the so-called solitaires, sold as single stones, are made up of small stones cleverly put together. Under the blowpipe they separate. He adds the surprising statement that not one diamond in ten sold in this country is other than the refuse of the London market. Nearly all are off-colored, specked, or feathered, and are sold at a fictitious value.

Mr. Whymper among the Andes.

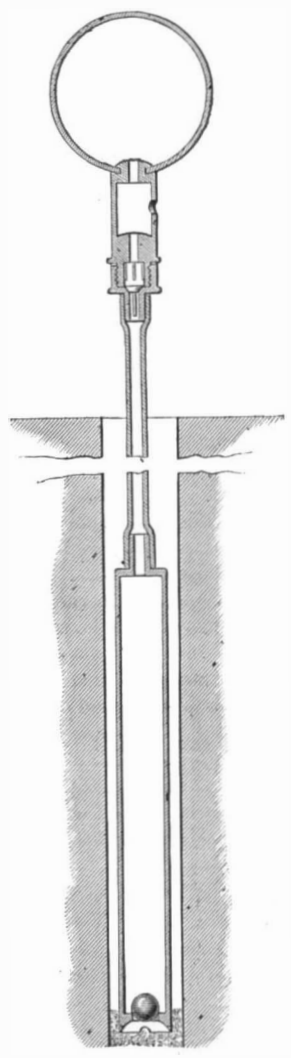
Mr. Whymper, the English mountain climber and artist, writes to a friend in London that, during a forty-one days' excursion north of Quito, the most of the time was spent in tents at altitudes varying from 10,000 to 14,500 feet. Seven days were passed without any shelter whatever. The objects of the trip were the exploration and ascents of Cayambe, Saraurcu, and Cotocachi, and the collection of Inca antiquities. He was accompanied by the two Carrels, the well known Swiss guides. They were entirely successful, though at a somewhat severe cost, being drenched every day and much reduced by exposure and diarrhea. On Saraurcu it rained on one occasion for seventy hours without ceasing for a minute, and for more than six days and a half out of seven consecutive ones. He found Cayambe to have a height of 19,200 feet, Saraurcu 15,600, and Cotocachi 16,200 feet. The ascent of the highest mountain gave least trouble, and the lowest one gave most. He waited for fourteen days before he could see it, as it is almost perpetually enveloped in mist.

The Best Vehicle.

An anecdote is told of a physician who was called to a foreign family to prescribe for a case of incipient consumption. He gave them a prescription for pills, and wrote the direction: "One pill to be taken three times a day, in any convenient vehicle." The family looked in the dictionary to get at the meaning of the prescription. They got on well until they got to the word vehicle. They found "cart, wagon, carriage, buggy, wheelbarrow." After grave consideration they came to the conclusion that the doctor meant the patient should ride out, and while in the vehicle he should take the pill. He followed the advice to the letter, and in a few weeks the fresh air and exercise secured the advantage which otherwise might not have come.

PNEUMATIC DRILL-HOLE CLEANER.

A simple device for removing drillings from drill holes is shown in the accompanying engraving. A tube having a ball valve at its lower end is connected at its upper end by a flexible tube with a hollow rubber ball, having a metallic neck containing a check valve, and having a small air hole in one side to be closed by the finger. The tube is inserted in the hole to be cleared of drillings; the rubber ball is compressed, and the air hole is closed by the finger. The ball being released, a partial vacuum is formed, and the external air pressure forces the drillings into the tube. The operation may be repeated several times before removing the tube, if necessary. The tube is emptied of drillings by pushing up the ball valve. This invention has been patented by Mr. J. L. Prentiss, of Cañon City, Col.



Drill Hole Cleaner.

Operations at Flood Rock.

In the government operations for the removal of Flood Rock, Hell Gate, East River, about one hundred and thirty men, in three sets, who relieve each other every eight hours, night and day, six days a week, and the work of making the East River practicable to ships of the largest class, is progressing rapidly. The area of rock to be undermined and blown away is between five and six acres, in addition to about three acres that have already been mined and made ready for the great explosion that is to give New York from twenty-six to thirty-two feet of water at low tide from Blackwell's Island into the Sound. The width of the channel at Flood Rock now is 600 feet; after the rock has been blown away it will be 1,200. It is believed that the velocity of the tide at Hell Gate will be decreased by the destruction of Flood Rock.

A Clever Trick.

The *Japan Mail* describes a clever trick which was being exhibited by a native juggler at Joshida-bashi. The performance takes place in a small room about twenty-six feet long by twelve feet wide, half being allotted to the spectators, who are admitted on payment of the moderate fee of two cents. The "properties" consist of a deal table and a sword, etc. After the usual soul-stirring flourish on a drum and samisen, a man and woman appear from behind a screen, the man binds the woman's head in a cloth, and she then kneels down close to the table, and sideways to the spectators. The man then draws the sword, makes a violent blow at the woman's head, she falls forward, arms extended and limbs twitching. He then, having first wiped the sword on a gory-looking piece of rag, takes up (apparently) the woman's head, wrapped in the cloth, and places it on the table. To all appearance it is a human head, the eyelids and features have a convulsive motion; presently the eyes open in a dreamy sort of way, and, to the accompaniment of the everlasting samisen, the head sings a mournful song. A curtain is interposed between the audience and the performers, and when again drawn back the woman is disclosed quietly seated alongside the man. When it is recollected that this all takes place within about three feet from the spectator, and that the "properties" are of the simplest description, some idea may be formed of the wonderful excellence of a performance which has excited attention.

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IMPROVEMENT IN STEAMSHIPS.

That there is ample room for improvements in the construction of steam vessels and in methods of operating them no one will doubt after reading the records of marine disasters for the last few months, and no one who has encountered a rough sea on ordinary vessels would fail to patronize a line of steamers free from pitching and rolling and practicably unsinkable.

Our engraving shows a steamer intended to be of sufficient length to ride several waves at once, and thus avoid pitching, and having breadth of beam sufficient to prevent rolling. The vessel is without masts or rigging, and is to be propelled entirely by steam.

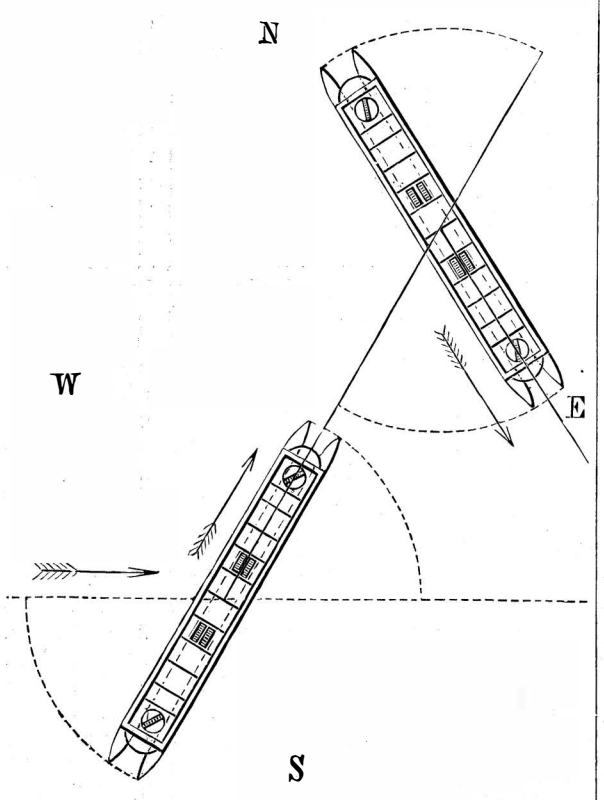
The vessel consists of two longitudinal tubular pontons, sustained parallel to each other at a suitable distance apart by transverse connecting braces, in combination with struts extending vertically from each ponton, longitudinal airtight cylinders connected to the upper ends of the vertical posts or struts immediately above and parallel to the pontons, and transverse braces connecting the two cylinders, the structure so formed being adapted to sustain the deck, cabins, and machinery of a sea-going vessel, and the arrangement being such that if the posts or struts and upper horizontal cylinders, which mainly support the deck and cabins, should accidentally become detached from the pontons by rough usage, the upper cylinders will still subserve the purpose of floating the remaining structure.

The tubes or pontons by which the vessel is supported are pointed at each end, to facilitate the passage of the vessel through the water, and are divided by transverse partitions into a series of water-tight compartments or bulkheads, so that if one of the compartments should be penetrated the remainder of the tube or ponton would be kept free from water. This arrangement of compartments adds greatly to the safety and strength of the vessel and renders it almost impossible to sink her.

The vessel is furnished with four paddle wheels, two of which are fixed at or near the center of the vessel, and are employed in driving the vessel ahead. Two other paddle wheels are arranged one at each end of the vessel. These paddle wheels have horizontal shafts, are supported in turn-tables which turn on vertical axes, so as to enable the paddle wheels to revolve in a plane parallel with the length of the vessel, or at right angles thereto, as shown in Fig. 2, or, if desirable, at any angle between the two positions. The object of thus swiveling the paddle wheels is to permit the vessel to be propelled in a direction transverse to the run of the waves without turning so as to present the broadside to the action of the waves, and they are also used in steering and maneuvering the vessel. There is at each end of the vessel a rudder of the usual form.

To make the ship lay to, in case of a storm, and to prevent as far as possible the drifting of the vessel in the direction of the run of the waves, the inventor has applied what he calls "water anchors," which consist of heavy iron plates hinged at the under side of the vessel and arranged transversely. When the vessel lays to and it is desired to keep from drifting, the anchor in the end of the vessel heading the run of the waves is let down; but when the vessel is being propelled forward, these anchors are swung up and secured in a horizontal position at the under side of the vessel.

The inventor states that, as the displacement of water is much less than that of common vessels, and as the propelling power is much greater, a very high rate of speed can be attained; and, although the vessel is very long, it may be maneuvered as readily as shorter vessels, as the end paddle



OLSEN'S PONTON STEAMER.—MANEUVERING.

wheels may be used in conjunction with the rudders in steering. It is easy, with this arrangement of machinery, to turn her in her own length.

The "Ponton Steamship" is peculiarly adapted for ocean navigation, but it is believed that even on rivers and lakes it will prove superior to other vessels. It can be made long enough to span several waves at once, thereby avoiding all pitching, and by never allowing the side to be presented to the rim of the waves rolling will be avoided.

In regard to her course in relation to the wind: Suppose the ship to be sailing east, then west and east winds are fair. Winds from any point within an eighth of the compass of these winds would not alter the course of the ship, but if heavy northerly or southerly winds prevailed it would be necessary to beat against them by tacking. The annexed diagram shows the maneuvering of the ship when sailing east with a north wind blowing. The arrows show the course of the vessel. It is claimed that the expense of building and running a vessel of this description will be much smaller than that of common ships.

Further information in regard to this invention may be obtained by addressing Mr. A. Olsen, 181 Richard street, Brooklyn, N. Y., until October 1. Permanent address, P. O. box 580, Salt Lake City, Utah.

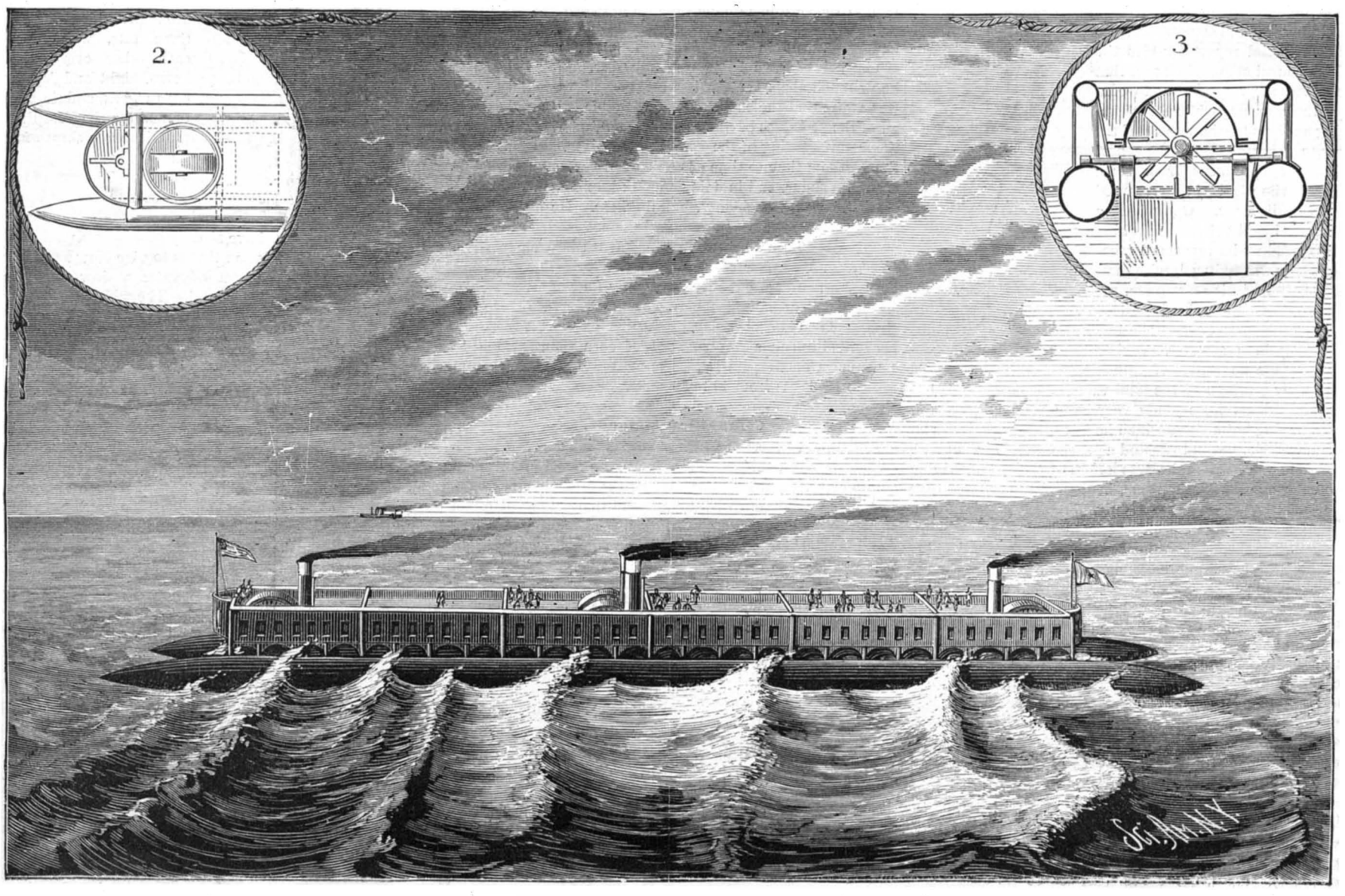
American vs. European Locomotives.

In his annual address as vice-president of the American Society of Civil Engineers, Mr. Octave Chanute compares the working of American and European locomotives, and makes out a strong case in favor of the superior efficiency of the former. Early locomotives were not expected to have a dragging power greater than one-fourteenth of the weight upon their driving wheels. Now, in other countries, one-seventh of the weight is considered a standard and satisfactory performance, while American locomotives regularly work up to one-fifth in winter and do rather better in summer. That is to say, a European locomotive weighing 88,000 pounds might be expected to pull a train equal in resistance to lifting 12,571 pounds, while an American locomotive would pull 19,555 pounds, or 55 per cent more. The average locomotive of Europe travels 15,720 miles per year, while the American performance is 21,900 miles. The reason assigned is simply that the American machines are better ones, and two chief improvements on the European prototype are mentioned: First, the leading wheels of locomotives and all car wheels are not rigidly atttached to the frames, but are fixed to trucks pivoted at the center; and, secondly, equalizing levers are used to distribute the weight equally over the driving wheels, thus keeping its apportionment nearly constant, while the wheels are free to adapt themselves to all the irregularities of the track. These and other improvements have reduced the resistance of cars so much that recent experiments have developed a rolling friction of only four or five pounds per ton, or actually only half that given in engineering note books.

MECHANICAL INVENTIONS.

An improved lock, provided with a controlling latch consisting of a flat bar provided with a pin extending into a slot in the tumbler and with a vertical projection at the end, has been patented by Mr. Christian F. Otto, of Zerbst, Germany.

Mr. Duryea S. Van Wyck, of Fishkill Plains, N. Y., has patented a device whereby power can be more conveniently applied to a sewing machine, and whereby the motion of the needle bar may be checked at will without arresting the



OLSEN'S SAFETY PONTON STEAMER.

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motion of the treadles or the momentum of the balance wheel. The invention consists of a seat and treadles arranged so that the operator can easily apply the weight of the body upon the latter, of novel attachments for slackening and tightening the driving belt, and for arresting and restoring motion to the needle bar.

Mr. John Connelly, of Hallowell, Me., has patented improvements in sewing-machines, which relate to a permanent attachment for sewing-machines of a certain class, the function of which is to aid in removing the shuttle from the raceway. It consists of a spring-plunger or lifting-rod, attached to the oil pan of a sewing-machine beneath the raceway, so that it is made available in raising the shuttle when it is to be removed.

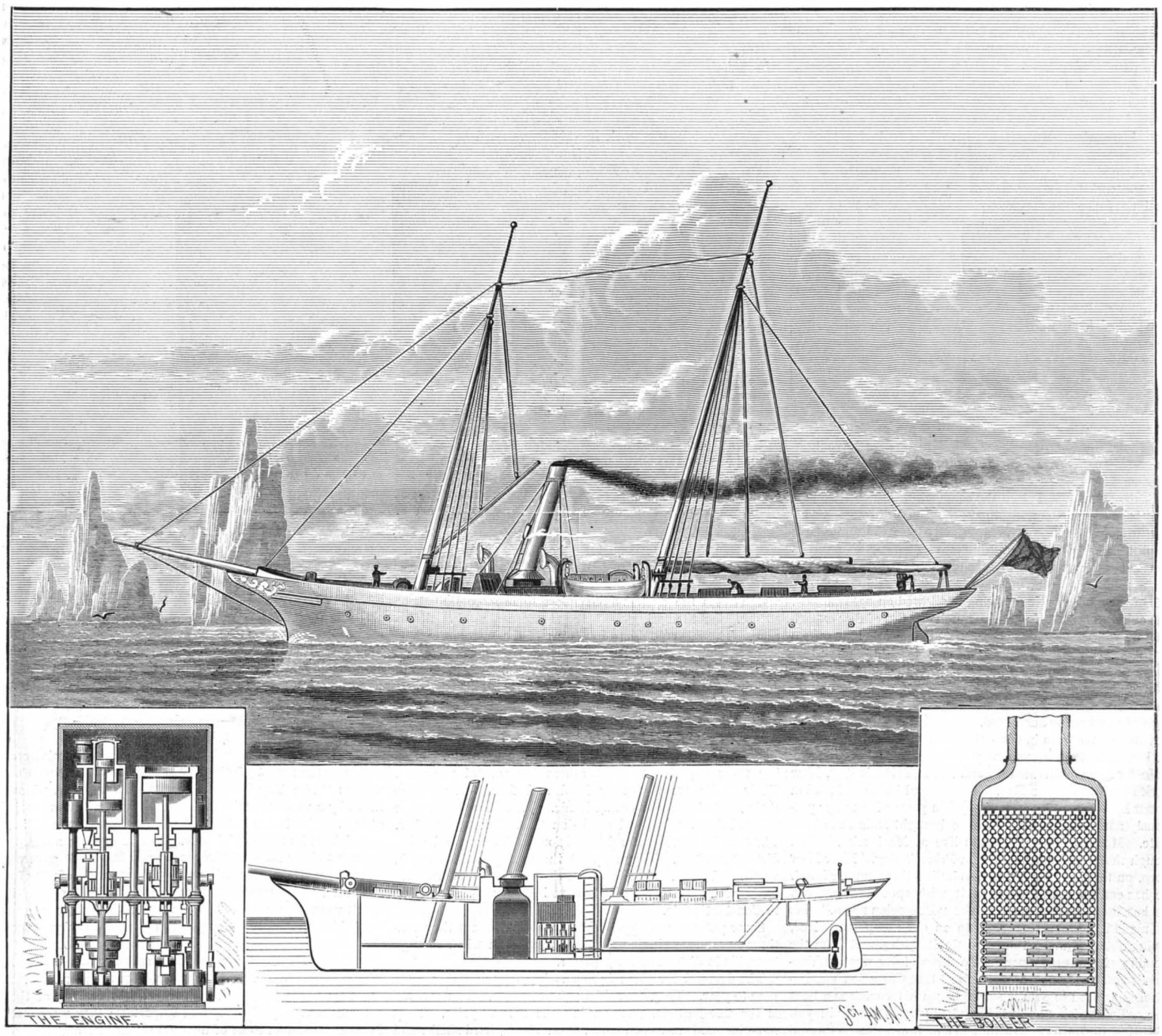
THE ANTHRACITE.

THE LITTLE STEAMER WHICH IS RUN BY ONE POUND OF COAL PER HORSE POWER PER HOUR.

The recent arrival of this little vessel in New York Harbor has excited an unusual degree of interest among engineers. Those interested in running marine boilers and engines are curious to know all the particulars regarding the machinery of the craft, which gives a practical illustration of the attainment of the greatest economy in fuel ever yet reached. We therefore present the accompanying engraving illustrating the general appearance of the steamer, and give outlines of her machinery, showing the proportionate space it takes up in the vessel. In former numbers of the SCIENTIFIC AMERICAN, as well as of the SUPPLEMENT, we have given some of the leading particulars regarding her construction, and have illustrated and described the Perkins system of utilizing steam at high pressures, and we now present some details not before given.

Of the 84 feet length of the Anthracite, her engines, furnaces, and boilers take up a space of 22 feet 6 inches, leaving a hatchway, kitchen, and forecastle cabin in the forepart of the boat, besides a water-tight bulkhead, which takes up 5 or 6 feet; abaft the engines are three cabins, with extra sleeping bunks beside the hatchway, and a water-tight bulkhead in the stern. The screw is of the ordinary fish tail pattern, with two blades. Her gross tonnage is 70·26 tons, and her registered tonnage 27·91 tons. Her average consumption of coal since she left England, on the voyage thence to Newfoundland, and from there here, has been one ton of coal a day, Welsh bituminous coal having been burned on the voyage. The weather was very rough coming out, consequently the sails could be used but little, and she is not remarkably well fitted for sailing, but her lines are such that she is well adapted to outride the roughest sea. The counter which registers the revolutions of her screw was set at 0 before she left England, and now marks 3,980,000. She has hitherto burned only bituminous coal, but it is intended to test the economy of using anthracite. In the voyage over the furnace was operated without any artificial blast, the natural draught only being used, but there is a fan blower connected with it which can be brought into use if increased consumption of fuel and a proportionately higher pressure of steam are desired.

The peculiarity of the machinery which effects the great economy of fuel lies solely in the means employed for using steam at very high pressures safely, and without undue wear or strain. The average boiler pressure on the voyage over was from 350 to 400 pounds to the square inch, but the boilers had previously been tested up to 2,500 pounds per square inch by hydraulic pressure, this pressure having been maintained for some time without showing any defects whatever. The body of the boiler consists of a series of horizontal tubes, welded up at each end, and connected together by a vertical tube, and the several sections are connected by a vertical tube to the top ring of the fire box, and by another to the steam collecting tube. The fire box is formed of tubes bent into a rectangular shape. The boiler is surrounded by a double casing of thin sheet iron, filled up with non-conducting material to prevent loss of heat. The cylinders and valve boxes are steam jacketed, and further protected by jackets of non-conducting material, so that, although all the parts are kept at a high temperature, the heat given out in the engine and fire room is much less than is usual with ordinary marine engines. The sections of tubes of the boiler are connected so that any one of the sections may be taken out and replaced without interfering with the others, and in case of any accident causing a rupture of one of the tubes, the comparatively small amount of steam liberated would escape up the smoke stack, while the remaining sections of tubes could be used with increased pressue to make good the loss. Very little water is lost in operating these boilers and engines. All the joints and valves are practically very nearly perfect. The steam generated is constantly and completely condensed in a surface condenser, and the water is reused; the loss of water is extremely small, and the additions required are easily provided for. Under these circumstances there is no deposit or scale inside the boiler, and the wear of the boiler is very slow. One built and operated on this principle, which was taken to pieces after twelve years' use, showed no appreciable effects of use. The steam required for the whistle, and also that for cooking, is generated in a small supplementary boiler heated by a coil from the main boiler, the coil being placed inside the boiler and in contact with the sea water, from which the steam is made. The steam coming from the main boiler is returned to the condenser to be reused in the boiler.



THE ANTHRACITE THE SMALLEST STEAMER THAT EVER CROSSED THE OCEAN.

The difficulty arising from friction and imperfect joints in practically working machinery at high pressures was one of the most serious obstacles encountered in developing this system. The inventor, after a long series of experiments, adopted an anti-friction alloy, of which the packing rings and internal rubbing surfaces are made. No lubrication is required beyond that furnished by the steam. The inventor states that cylinders fitted with piston rings made of this metal have been several years at work, the cylinders showing no signs of wear, the only wear occurring on the rings, which may be easily and cheaply replaced. Not only is the cost of oil and grease thus saved, but the destructive action on the machinery and boiler of the acids generated from lubricants is avoided.

For the use of steam at these high pressures three differ-

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ent sized cylinders are employed, all jacketed with spiral tubes cast in the metal, which are supplied with steam direct from the boilers, and keep up the temperature of the cylinders. The first and second cylinders are arranged one above the other, and their pistons are connected to a common piston rod. The operation is thus described by Mr. Loftus Perkins, the inventor, in a paper read before the Institution of Mechanical Engineers, London:

"The high pressure steam is introduced into the upper end of the first cylinder, where there is no gland, and where the piston is formed so as to require no lubricating material. The steam is cut off at about half stroke in this cylinder, and when it is admitted for the return stroke into the bottom of the second cylinder, of four times the area, the temperature is so much reduced as to cause no difficulty when brought into contact with the piston rod gland. From the bottom of the second cylinder the steam expands into the top of the same cylinder, which is of larger capacity than the bottom, and serves as a chamber, and is in direct communication with the valve box of the third cylinder; this last is double-acting, and is arranged to cut off at about a quarter stroke, and at the termination of the stroke exhausts into the condenser, with a total expansion of about thirty-two times."

Although it has been some years since Mr. Perkins began to advocate the merits of this system, and he has taken out many patents covering his inventions connected therewith, the difficulties attending its practical working, and the disposition to oppose it of those who had enormous sums invested in old style machinery, have thus far prevented its general adoption, although in several cases in England it has been successfully introduced. The boilers and engines of the Anthracite contain all the latest improvements of the inventor, and it is believed they afford a practical demonstration of the entire success of the Perkins system, and show how all stationary and marine engines can be run at an expense of less than one-half the present cost for fuel. Two and a half pounds of coal per horse power per hour is now considered very economical running, and some of our best managed ocean steamers use one hundred tons of coal a day in their voyages. To demonstrate the practicability of reducing this more than one-half, thereby not only saving the cost of fuel, but giving so much more space for freight, is the purpose of the visit of the Anthracite to our waters.

STATEN ISLAND AND OYSTERS.

[*Continued from page* 65.]

As soon as attention was turned to the necessity of cultivation, the Legislature was applied to. Laws have been enacted that allow each individual to take up three acres in his own name. The occupant must stake out and clearly mark the ground, and plant the same with not less than fifty bushels of seed oysters within six months, or he forfeits his right to hold it. Those owning land along the shore have the first right to the ground in front of them. No oysterman is allowed to take fish in any county but his own, nor anywhere on public beds, between the 15th of June and the 15th of September. No dredging is allowed on natural beds. The cultivators have found so much of their labor experimental that they have earnestly resisted all efforts to tax them for their grounds. They look upon a tax as a burden that would overweigh and seriously check their industry. The owners of grounds buy their seed from men who obtain it from natural beds. These men, by the hundreds, are engaged in procuring such seed. It is their business only, as they hire out to help in other things during the season that the law forbids their working upon natural beds.

Most of the cultivated ground lies in Prince's Bay, New York Bay, and Raritan Bay. The natural beds are found in Staten Island Sound, the Kills, and in parts of the bays previously named. Much seed is also brought from out of the State. Many of the cultivators live at Mariner's Harbor, though their oyster farms are in Prince's Bay. Near New Dorp, on this bay, Mr. Petler has built a fine summer hotel. He has endeavored to surround it with special attractions. He has fitted up one room as the "Pompeian room." He has made it to resemble a room in an old Pompeian palace, having obtained many things to do it with direct from the remains of ancient Pompeii. In this vicinity was the Vanderbilt home. It was a "pirogua" that Cornelius Vanderbilt first aspired to own when he began his career as a boat man. To this island of his birth he always remained loyal.

Most of the oysters grow for three or four years on ground that is a little muddy. They are moved the spring before using to a hard and sandy bottom. They are taken up by tongues or dredges, culled and put into floats, and taken where they may have an infusion of fresher water, and then to the markets. Most of the Staten Island oysters have to to taken up near Rahway for the freshening. They are usually left in the floats there over one tide.

Sail boats or yachts are almost universally used. One cultivator has lately procured a small steamer. The harbor of New York abounds in tugboats. Their captains have an understanding with the oystermen; so, if the wind is unfavorable or the tide, they hitch on and pull the oyster boats up to the city. For pay the oystermen keep the tugmen supplied with oysters. These boats carry all the way from one to four hundred bushels at each trip. The Staten Island men are considerably annoyed by persons from New Jersey oystering in their waters. So far they have failed to secure a very effectual check to this.

Thirty years ago the oysters were prepared for market by men and boys handling them all over to sort them. Workmen stood in the water even in the coldest weather beside a pile of oysters and sorted them into a boat. Then it took fifteen persons all day to get a boat ready. It involved great exposure and hardship. Some years ago an old man straightened himself up after such a job, saying he could stand it no longer. He contrived a fork, at first a little straight-tined affair, with a guard at the top to prevent the oysters falling off. It at once took with the men. All quickly provided themselves The day of hand culling was over. The fork was gradually improved in size and shape, until it has reached a very perfect and complete form. Now with this aid two men can accomplish more in two hours than fifteen men formerly did in a whole day.

The beds here are in shoaler water than on the Connecticut shore. But the full and swift tides render them a protection from ice in winter, and some other troubles of shoal water in more quiet seas.

Stars and drills have at times been a trouble, but their greatest enemy has been the "drum fish." When the oysterman hears him "booming" over his grounds he trembles for his property; for this fish will crunch up oysters as cattle will apples or clover. The "moss-bunker" fishermen are now catching many of them, and thus rendering good service to the oyster cultivators.

Every planter has from five to ten men in his constant employ. He also hires others for short periods from time to time. It will be seen that considerable numbers of the people living around the shores of Staten Island are working at some part of the oyster business. Quite a good many colored families live at New Dorp and Prince's Bay. Most of these find steady work in this line. Seed oysters are found in considerable quantities from Rossville, on the northwest shore, up to Elizabethport, New Jersey. The same is true around Schuten's Island, and from Kill von Kull down to Port Richmond.

Important facts are to be noted in the conclusions to which their long experience has led the Staten Island oyster cultivators.

1. They think their planting grounds need rest every few years. An element in the mud or sand, needful for producing good oysters, becomes exhausted by successive crops. To then leave the ground bare for a year or two enables it to regain that element anew.

2. The continual working of the ground produces many "poppy" mud holes. These are holes where the mud has become so soft and slimy it kills all that is put upon it. A year or two of rest allows the action of the water to fill up and "heal" over such holes.

Some say the "poppy" mud holes render the ground poisonous to the oyster. They note this condition by finding an increasing number of black-meated oysters, and soon after many dead ones. Ceasing all work there for one or two years they can then plant anew with an assurance of success.

3. The ground is affected by the change from winter to summer. Though no frost is in the bottom of the sea, yet there seems to be a certain hardness of the mud or sand which holds the oysters and renders them more difficult to secure. As the spring opens the men see a marked difference. There is an evident loosening of the bottom much as takes place in the upland as the frost comes out of it.

4. A wet summer is much more favorable to the growth and quality of oysters than a dry season. This partly accounts for the varying quality of oysters produced in the same waters. Thus, a year ago, New York Bay oysters were much better than usual.

5. One peculiarity is found in Staten Island oysters, making them superior to most others for several purposes. Their shells are unusually hard and firm, and preserve their meats better than other kinds. Therefore they can be shipped farther in good condition than almost any other. They are in considerable demand for the foreign and other distant markets. They are sent in large quantities north, south, and west. One firm sent three thousand barrels to California a year ago. They have been sent as far east as to Constantinople.

Some patrons are so attached to these oysters they continue to send for single gallons of them even when they go to reside in distant country places.

The demand for them increases in every direction from year to year. They are sold in three grades. The "box" is the finest grade, commanding the highest price. They must be good size, good color, good shape, hard shells, and even size. The next are "barrel" oysters, running a little smaller and a little less even. The third are "culls." The second grade are also called "counts." The "culls" sell from thirty to forty-five cents a hundred, when the "box" grade cost from sixty to ninety cents per hundred.

Those that are sold out of the shell are opened on the boats at New York. A single firm on the North River sometimes opens one hundred and fifty thousand counts in a single day. Men who open oysters there are able to earn about three dollars a day.

With a fair season and no special adverse circumstances, the business is lucrative. But in the present stage of practical knowledge the risks are so many and so great that no man is able to estimate with much certainty at the beginning of a season what its results may be. Every year shows improvement, however, both in the quality of the oysters and the modes and security of cultivating and handling them.

Hundreds of vessels, thousands of people, and millions of money are already employed in the business. Its growing value only begins to be realized. It most certainly has a grand future. Staten Island has been noted for several important things, but this developing industry promises more for it than all its other interests, ancient or modern.

The island was General Horn's headquarters, and he had thirty thousand troops there during a most important crisis of the Revolutionary war. To the great disgust of its inhabitants a quarantine station was maintained on its north shore for many years. Some of its names recall noted places and persons of the Old World. Its climate is of great salubrity. Many seek its shores and elevations for quiet and healthy homes. Several humane retreats, like "The Sailors' Snug Harbor," "Retreat for Sick Seamen," "Home for Destitute Children of Seamen," "The S. R. Smith Infirmary for the Sick," are located upon it. Some of its old taverns bore the significant names of "The Black Horse," "The Bull's Head," "The Morning Star," "The Blazing Stars." But all these names and interests, though interesting and important, are eclipsed by the healthful and useful oyster cultivation.

ENGINEERING INVENTIONS.

The nuts of bolts for securing fish plates to railroad rails have been locked by means of bars or slotted plates, which were so constructed and applied as to abut against one or more sides of the nuts, and were held fixed in position by the nuts themselves, or by attachment to the bolts, or by wedging between the head or base of the rail and the nuts. Mr. James W. Payne, of Tipton, Mo., has patented a simple means for securing a nut locking plate, whereby it may be easily and quickly applied and removed.

Mr. Jacob Rhule, Jr., of Pittsburg, Pa., has patented a feed water heater for the inside of a boiler, which serves at the same time as a depository of mud and sediment from the water, and thereby prevents scale in the boiler.

Mr. John J. Reed, of Lyons, Ia., has patented an improvement in windmills. The invention consists in a wheel hung to swing in a horizontal plane, and having a vane hung on the wheel to swing in the same plane, the normal position of the vane being slightly inclined to the axis of the wheel, so that the wheel is held by the vane with its edge more or less presented to the wind, according to the pressure. This movement is regulated by an adjustable weight connected with the wheel. Brake mechanism of novel construction is applied to this mill.

Mr. William Tucker, of East Toledo, Ohio, has patented an improvement in the class of automatic couplings for railroad cars in which a spring jaw upon the draw head of one car engages with a jaw secured to the draw head of the next adjoining car when the cars are to be coupled, and in which chains secured to the spring jaw are employed to draw and hold the spring jaw in such position that it will not engage with the jaw of the next adjoining car, so that the coupling may be rendered inoperative when desired, or may be readily uncoupled without going between the cars.

An improved lubricator has been patented by Messrs. Isham T. Hardy and Noah H. Dibble, of St. Louis, Mo. The invention consists of a combined steam condenser, oil receptacle or tank, and gauge or indicator, so arranged that the steam from the boiler entering the condenser and condensing therein will flow into the oil receptacle or tank and force the oil thence through the gauge or indicator into the steam cylinder, to which the device may be attached.

The Tay Bridge Disaster.

The London *Times* makes the following editorial comments on the report of the Tay Bridge Investigating Committee: "The Tay Bridge, it appears, was simply blown down by a violent gale of wind while a train was passing over it. This is the net result of the inquiry when disengaged from its technical details. The bridge was not strong enough to bear the strain imposed upon it, and it gave way in consequence of the inherent weakness and defects of its structure. The remoter causes which brought about this result were numerous and far-reaching. First, the spans of the bridge were enlarged beyond the original design in consequence of difficulties encountered in connection with the foundations. Then, for the same reason, piers consisting of cast-iron columns were substituted for the piers of brickwork originally proposed. Moreover, the casting of these columns was very slovenly and imperfect; they were found in many instances to be of unequal thickness, and the bolt-holes connecting the various sections together, as well as those in the 'lugs' to which the cross-braces were attached, were all merely cast and left conical instead of being properly drilled and reduced to a cylindrical form. Thus, the cross-braces, on which the whole strength of the structure depended as regards resistance to lateral pressure, were very imperfectly fastened, and, by consequence, ill calculated to bear the strain imposed upon them. Such being the initial defects of the bridge, its practical supervision was intrusted to a person very imperfectly qualified, in the judgment of the court, to undertake such a responsibility. What defects he observed he did his best to remedy promptly; but he does not seem to have been sufficiently alive to the serious indications of weakness and danger shown in the loosening of the ties of the cross-braces, to the effect of which, as seems most probable, the disaster must be immediately attributed. In fact, it is impossible to resist the conclusion that the bridge was an unsafe structure from the very beginning. A weak and slender bridge is built in a peculiarly exposed situation; no attempt is made to calculate the possible effects of wind-

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pressure or to provide against them; the structure is gradually weakened by excessive speeds, by stress of weather, and by the original fault of the materials used, and the defects are very inadequately remedied by a superintendent imperfectly qualified for such a task; a gale of wind comes, a train on the bridge is exposed to it, and the whole structure gives way at it weakest point. It is very difficult to admit that such an assemblage of causes and effects is rightly to be called an accident."

MISCELLANEOUS INVENTIONS.

An improved horse collar has been patented by Mr. Fletcher C. Scott, of Fincastle, Va. This invention is an improvement in the class of horse collars in which the hames and collar proper are permanently attached to each other. The collar proper is formed of a soft stuffed inner portion and an outer leather plate, which is comparatively stiff, and forms the ornamental face of the collar, and also covers and protects the inner part. The collar is divided at top and bottom, and to each of the two parts thus formed is attached an iron hame, which is inserted and secured between the outer covering plate and the inner or stuffed portion. Both the hames and the parts of the divided collar proper are connected at top and bottom by means of straps, so that they may be adjusted together to adapt the collar as a whole to necks of animals of different sizes.

Mr. John McLeod, of 127 W. 26th st., N. Y. city, has invented an improved self-adjusting mast for boats and vessels. It is hung upon trunnions so that it may swing from side to side, and it carries at its lower end an arc which is preferably made tubular, and is armed with very strong springs which resist the lateral movement of the lower end of the mast. The mast is also provided at its foot or lower end with a heavy counterbalance weight which increases the inertia of the mast and answers as an automatically shifting ballast.

An improved weather strip has been patented by Mr. John M. Ceis, of Abilene, Kan. The object of this invention is to furnish weather strips for doors to prevent wind, snow, rain, and dust from entering the house beneath the lower edge of the door, and which is simple, effective, and durable.

Mr. Asa G. Golding, of New York city, has patented a double walled pitcher, so constructed that the inner wall or lining can be readily removed and replaced, and which will not allow the contents of the pitcher to pass through the joint between the inner wall and its support into the space between the walls.

An improved sewer gas trap has been patented by Mr. Albert F. Pflughaupt, Jr., of Brooklyn, N. Y. The object of this invention is to furnish devices for connecting the waste pipes of houses with sewers, which is so constructed as to prevent sewer gas from passing from sewers into houses through the waste pipes.

Mr. William Hadden, of New York city, has patented an improved duplex telegraph system for sending and receiving two sets of signals in the same direction on one wire at the same time. This invention cannot be clearly described without diagrams.

Messrs. Edward C. Smith and Leroy S. Winters, of Lincoln, Neb., have patented an improved carpet stretcher, of simple construction, which will stretch carpets and hold any desired portion of the edge thereof while being nailed to the floor

Mr. Charles H. Brazeal, of Tye River Depot, Va., has invented a device adapted for use in connection with harness, for the purpose of enabling a horse to be detached from a vehicle. The device consists mainly of a buckle having a sliding tongue to which is attached a strap that is held by or is accessible to the driver, and which being pulled will retract said tongue and allow disconnection of portions of the harness, so that the horse may go free.

Mr. Sanford Bray, of Charlestown, Mass., has patented an improved target which may be thrown into the air without the aid of a trap, and whose broad tail pieces or wings shall be so attached to the body of the target as to be broken off or detached from the body of the target when struck by a ball or by shot.

Mr. George O. Sanborn, of Boston, Mass., has patented an improved cover or top for wooden vessels designed to contain pickles, preserves, etc., and to be used for shipping such goods. The invention consists, first, in providing the wooden cover proper of the vessel with a central opening, and in closing the latter with a thin transparent glass plate, which is secured by cement applied and held in an undercut groove. The wooden cover proper forms a strong, stiff, and durable integral portion of vessel, while the glass plate enables the contents to be easily inspected without allowing ingress of air, and it is adapted to be easily detached whenever it becomes requisite to have access to or to remove the contents.

Messrs. Theodore Phillips and Harley Phillips, of Winchester, Iowa, have patented an improvement in washing machines, which consists of a tank having a set of parallel strips in the bottom with rigid vertical bars at the end, and with inclined and notched upper edges forming a washboard, an oscillating beater consisting of a series of fingers passing between the parallel strips of the washboard and connected to the lower end of a horizontally pivoted lever handle, and a set of fingers fixed to a rock shaft and adapted to pass between the vertical bars rising from the ends of the washboard.

An improvement in heating stoves has been patented by Mr. John H. Shimmons, of Lawrence, Kan. This is an improvement in heating stoves of that class in which a set of pipes lead the air through the fire chamber into an air chamber above, from which air chamber pipes conduct the heated air through a drum placed above the air chamber, which drum receives the products of combustion, which further heat the air as it passes through the pipes.

An improved harness maker's sewing-horse has been patented by Mr. Joseph B. Underwood, of Fayetteville, N. C. This invention relates to a machine for harness makers' use, known as the "sewing-horse." It is an improvement upon that form of sewing-horse for which letters patent No. 221,373 were granted to the same inventor, November 4, 1879.

Mr. Stephen M. Hoye, of Mount Carmel, Conn., has patented an improved die for swaging carriage-clips. Dies of the ordinary construction have no side or end stops to confine the metal in its proper place. It escapes at both sides and ends of the dies. The clip, therefore, has a rough edge and requires to be trimmed, which is done in a trimming-press. From such press the clip is placed under a trip-hammer, for the purpose of rounding and pointing the shank. The improved die produces a perfect clip at one operation.

An improved screw-tap has been patented by Mr. Timothy A. Fleming, of Hoosick Falls, N. Y. The object of this invention is to cut a right and left hand thread in the same machine without reversing the motion, as is customary, by additional shafting and pulleys. The inventor accomplishes this by a change in the form of the machine-tap. Two taps are used—the ordinary right hand tap, together with the new left hand tap. It is equally applicable to vertical and horizontal tapping-machines, either single or in gangs.

Mr. Thomas J. F. Regan, of Brooklyn, N. Y., has patented an improved process for making illuminating gas which consists, essentially, in placing in a closed receiver a quantity of caustic lime and pouring upon it as much naphtha or other light hydrocarbon as it will absorb, and then drawing from the receiver by suitable means the gas arising from the saturated lime and forcing it into a gasometer. The lime absorbs a small quantity of water from the hydrocarbon, and also a small quantity of condensed petroleum or petroleum oil. The gas drawn off by the exhauster is permanent, and will remain uncondensed in the gasometer. This gas answers every requirement for illuminating and heating purposes, and may be produced at much less expense than ordinary coal gas.

An improved magazine stove has been patented by Mr. Carlton Seaver, of Traer, Iowa. The object of this invention is to construct a stove so that the smoke and other products of combustion shall pass downward through the bottom thereof into a pipe that leads under the floor of the room in which the stove is placed and into the chimney, while the heat and light of the fire shall warm and light the room in which the stove is.

Mr. George H. Brown, of Mount Vernon, N. Y., has patented a support for pictures so constructed that it may be put up and taken down without marring the wall, will allow the positions of the pictures to be readily changed, and will prevent the pictures from being accidentally detached.

A Gold Bearing Newspaper.

A correspondent of the San Francisco *Call* writes to that paper as follows: "I had observed, previous to last February, that the *Call* often contained golden nuggets, but from the 6th of that month to the end it was rare to have a number without its golden show. From the paper of the 6th I took fifty-six pieces of gold, the thickness of the *Call*, and varying in size from that of a small pin head to nearly the size of a three cent piece. I think I have more than a hundred pieces of gold taken from the paper that month. All left a hole when removed, as the thin film of paper on the inside was rendered brittle by the hard pressure which the calender rolls gave as they flattened out the golden deposits. In addition to the gold, I got platinum, silver, iron, tin, and some lead."

The explanation of the discovery is that in the manufacture of the paper pulp water is used that has been passed through a flume in which miners have washed dirt containing all kinds of precious metals. The gold is what is known as "float gold," and escapes the miners who still follow the primitive methods of washing. Some of the water used is taken from artesian wells. The manufacturers say that they have often noticed a substance that glistened in the water, but that they supposed it to be mica, as the wells were bored through mica deposits.

How to Make Fern Pictures.

There are two ways—the mechanical and the photographical. For the first, take a sheet of strong white paper, and with an atomizer pass over it a spray of very diluted mucilage, so as to obtain a very thin and slightly sticking film, which will make the ferns adhere of which it is desired to make the picture. The ferns and leaves must have been first pressed in a book, and after arranging them to suit your taste, cause them to lie as closely to the paper as possible; fill an atomizer with very diluted India ink, and blow a spray over the ferns, more or less in proportion as you want a darker or lighter shade. It is well to do this with intermissions, letting it dry a little, so as to avoid excess of moisture and possibility of running the liquid into drops. When nearly dry, but still a little moist, remove the ferns, which may be used over again several times. For the photographic method, cover a sheet of paper with a weak solution of salt in water and some white of an egg, well beaten; after it is dry, take it into a dark room, and with a tuft of cotton pass over it a solution of nitrate of silver (50 grains to an ounce of water); dry it in the dark, and the coat of chloride of silver formed on its surface will receive the impression. Then arrange your ferns between two plates of glass, and cut the paper to the same size as the glass plates; place it under them and expose to the sun, in the same way as a photographer prints a portrait. Watch it until dark enough, and before removing the paper from the glass take it into a dark room. Here place the picture in a solution of hyposulphite of soda, which will dissolve the chloride of silver, but leave the decomposed material (finely divided black silver) which forms the black background, while the shadow of the leaves will be white.—*Chemist and Druggist.*

A Remarkable Surgical Operation.

For about a year a little girl, ten years of age, has been a patient in the County Hospital, Chicago, suffering from a burn so extensive that the ordinary treatment by skin grafting hopelessly failed to effect a cure. It was therefore decided to try the experiment of transplanting a large section of skin partially detached from a healthy subject, the girl's twelve year old brother consenting to be flayed for his sister's sake. Drs. Lee and Feuger conducted the operation, which is described as follows by a reporter of the Chicago *Tribune:* A curious box had been constructed under the supervision of Dr. Murphy. It resembled nothing more than a pair of scissors opened out, except that one part was about four inches higher than the other. On one face of the cross the little girl was laid face downwards. On the other the boy lay on his side so that his leg crossed his sister, the part of the thigh from which the skin was to be taken being just over the burn on the girl. The children were kept unconscious during the entire operation by the use of ether, and two assistants constantly directed the vapor of carbolic acid on the wounds of both the boy and the girl. The surgeons then cut from the boy's thigh a leaf of skin four inches wide, five inches long, leaving it attached by the under side. The wound of the girl was then cleared of its decaying matter. The flap of the boy's skin was then laid on the wound and stitched to the outer edge of the skin about the wound, without cutting the edge, which rendered it still a part of the boy's fleshy covering. This was done to secure the vitality of the boy for the skin which is expected to grow to be a part of his exhausted sister. The boy's wound was ugly in appearance, but the skin had been separated, or dissected, so neatly that it will be easy to heal over by the usual process of grafting. The children, as they lay in this position, were so bandaged that they cannot possibly tear the flap of skin or move from their position. Thus their dual existence was begun, which will last for about three weeks. By that time the success of the operation may be known. During that length of time the boy's vital forces will be in a measure transferred to the assistance of his sister, and, at the end of that time, it is hoped that the transplanting will be complete and the skin firmly grown on the burned portion. The flap is not quite large enough, and, before the skin is finally severed from the boy, a still further portion will be dissected and applied to the remainder of the wound. The little girl's pulse dropped considerably toward the close of the operation, but she was revived by the application to the nostrils of a cloth dipped in brandy. The operation was a success as far as it went, and, if nature takes hold in the manner expected, the brave boy can congratulate himself on having saved his sister's life.

The Driven Well for Fire Purposes.

The *Firemen's Journal*, in an appreciative article on this subject, recommends the general adoption of the driven well for fire purposes, and for all small country places, where there is no large and constant water supply, we should think the suggestion an eminently practical one. In the SCIENTIFIC AMERICAN, of March 13, we gave some account of this system of obtaining water, and what was being done under it in New York city, where it is now largely used to save the expense attendant upon a large use of water from the city reservoirs. To obtain a supply sufficient for the usual form of fire engines in use in country places it might be necessary to put down two or three of these driven wells near each other, and connect them, so that the suction pipe of an engine being attached, water might be drawn from all the wells at the same time. Of course, these wells, working on the principle that the water is drawn from the ground around them by making a vacuum in the tube, will supply much more water than an ordinary open well, and they are not ordinarily so expensive to put down. An abundant supply of water can usually be obtained at distances varying from twenty to fifty feet from the surface, but, in each case where a well is put down, it should be at once thoroughly tested, to determine the probable permanent yield of the water-giving strata when it is driven.

The Texas Cattle Drive.

The Omaha *Republican* gives a detailed statement of this year's cattle drive, the total reaching 301,000. Of this number about 50,000 head will be driven to the Union Pacific. The cattle are in good condition, fully up to the standard of previous years, and are mostly one, two, and three years old, very few being beef cattle. The drive to Nebraska would have been larger had it not been for the drought making a scarcity of grass along the road. About 25,000 horses are being driven up from Texas this season, of which number about 5,000 go to Nebraska.

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An Early Plan to Improve the Mouth of the Mississippi by Jetties.

The New Orleans *Times* finds on page 357 of the first volume of Gayarre's "History of Louisiana" the following notice of an early proposition to deepen the mouth of the Mississippi River by means of jetties. The author says:

"The necessity of deepening the mouth of the Mississippi had attracted the attention of the French Government at the earliest period of the establishment of the colony, and the engineer Pauger made, in this year, 1723, a very interesting report on the practicability of arriving at this desired result. He represented that it was easy and not expensive to *fix* (fixer) or to control the current of the Mississippi so as to make it subservient to the plan of operating upon the sand banks which obstructed the several mouths of the river, and so as to give admittance to the largest ships, whatever might be the depth of water they drew; that, if necessary, a fine artificial harbor with quays might be created at the Balize, with the numerous resources which the nature of the locality offered, and that it might be effectually protected by such fortifications as he indicated. He recommended *to shut up all the mouths of the river except one,* in order to force a greater volume of water into the remaining channel, which would consequently acquire more depth."

It detracts nothing from the merit of Captain Eads' work that the idea of the system he adopted was not original with him. He never claimed that. It is to his credit, nevertheless, that he was able not only to appreciate the system, but was willing to risk fame and fortune in carrying it out in the face of strong professional opposition.

Our Trade in Foreign Fruits.

The seventh annual report of the foreign fruit trade of New York, just completed by U. S. Inspector of Customs J. H. Bostwick, contains much interesting information. The principal statistics for the year 1879 are as follows:

The importation of Mediterranean fruit at the port of New York during the year 1879 consisted of 108 cargoes by steamers and 54 by sailing vessels, and comprised 880,729 boxes and cases of oranges and 900,505 of lemons, showing an increase of 26 cargoes by steamers and 24 by sailing vessels, and of 525,732 boxes and cases over the importations of 1878. The number of oranges was 239,751,255, of which it is asserted 119,875,627 perished on the voyage, a loss of 50 per cent. The number of lemons was 315,176,750, of which it is asserted 113,463,620 perished on the voyage, a loss of 36 per cent. Total number of oranges and lemons, 554,927,975; boxes and cases of oranges and lemons, 1,781,234. There were 44,365 barrels and 56,721 half barrels of grapes imported last year, at a loss of 25 per cent, a slight decrease compared with the imports of the preceding year.

The trade in Mediterranean fruit during the past year has been disastrous to the parties engaged in it, especially to the producers. The price of box fruit was as a rule very low, particularly in the case of oranges imported from Catania and Palermo. These were seriously affected by a parasite which greatly impaired their value. A large proportion of the fruit arrived in bad order.

The importations of oranges from the West Indies consisted of 16 cargoes and several parts of cargoes by sailing vessels; also 33,736 barrels of oranges per steamers. Of the above, 21,286 barrels were from Kingston, Jamaica, and 7,450,100 oranges, of which 3,352,545 perished on the voyage. There were 15 cargoes and 665 barrels imported from Mayaguez, comprising 4,388,045 oranges, of which 1,912,195 perished on the voyage; from Havana, 7,212 barrels, comprising 2,307,735 oranges, of which 1,038,480 perished; from Nassau, 2,734 barrels, comprising 919,659 oranges, of which 299,249 perished; from Montego Bay, 1,389 barrels, comprising 771,665 oranges, of which 347,249 perished; from Trinidad, 445 barrels, comprising 285,917 oranges, of which 214,438 perished; from Abaco, 1 cargo, comprising 190,000 oranges, of which 17,000 perished; from Baracoa, parts of cargoes, comprising 84,900 oranges, of which 35,950 perished; from Guyanilla, 4 barrels, comprising 1,400 oranges, of which 600 perished. The above shows a grand total of 16,399,421 oranges, of which 7,217,706 perished, an average loss of 44 per cent. An increase is shown of two cargoes and 7,610 barrels of oranges over the imports of the preceding year.

The importation of bananas from the West Indies the past year consisted of 105 cargoes by sailing vessels. Of these there were 90 cargoes from Baracoa, comprising 191,888 bunches, and 15 cargoes from Port Antonio, comprising 28,823 bunches; from Kingston, per steamers, 47,965 bunches; from Montego Bay, per steamers, 36,134 bunches; from Trinidad, 284 bunches. Total number bunches of bananas imported from the West Indies, 305,094, of which 79,518 perished on the voyage, an average loss of 26 per cent. There were also imported from Aspinwall, per 55 steamers, 240,000 bunches of bananas, of which 38,000 bunches perished on the voyage, an average loss of 17½ per cent. There was an excess of 40,000 bunches of bananas over the imports of the previous year, and a decrease in loss of 22½ per cent.

The importations of pineapples consisted of 53 cargoes, of which 8 cargoes were from Eleuthera, 11 from Cat Island, 8 from Governor's Harbor, 9 from Nassau, 5 from Abaco, 3 from Rock Sound, 3 from Harbor Island, 1 from Tampum Bay, 1 from Rum Key, 2 from Mayaguez, part cargo from Antigua, and comprised 2,558,833 pineapples. There were also imported, per steamers from Havana, 143,555 pineapples; from Kingston, 21,148; and from Montego Bay, 16,466. The total number of pineapples imported from the places above named was 2,740,002, of which 712,391 perished on the voyage, showing average loss of 26 per cent. A comparison of the above with the imports of the preceding year shows an increase of about 40,000 pineapples.

Cocoanuts were imported from the following named places during the past year, viz.: Baracoa, 3,112,006; San Andreas, 1,540,863; Aspinwall (per steamers), 560,602; Carthagena, 374,492; Falmouth, 245,000; Ruatan, 217,500; Montego Bay (per steamers), 158,863; Honduras, 139,800; Port Antonio, 132,704; Port Maria, 100,000; Kingston (per steamers), 55,000; Gilarie, 38,800; St. Jago, 21,600; Mayaguez (part cargoes), 10,430; San Ann's Bay, 8,200; San Domingo (per steamer), 7,000; Maracaybo, 3,000; making a grand total of 8,205,578 cocoanuts, which comprised the cargoes and parts of cargoes of 114 vessels, exclusive of steamers. Of the above, 662,249 cocoanuts perished on the voyage, a loss of 8 per cent. A comparison of the above with the imports of 1878, the result shows a decrease of 981,307 cocoanuts.

The importation of limes comprised 988 barrels, on which there was a loss of 33 per cent; 126,000 grape fruit, loss 10 per cent; 5,144 shaddocks, loss 33 per cent; 9,000 plantains, loss 25 per cent; 28,000 mangoes, loss 80 per cent. There were also imported in small quantities of each, mandarins, cantaloupes, sapodillas, alligator pears, manma apples, and watermelons, on which there was a loss of 25 per cent. The countries and places whence the foregoing varieties of fruit were imported are the United States of Colombia, Mexico, Central and South America, Venezuela, British West Indies, French West Indies, Cuba, Porto Rico, England, Scotland, France, Spain, Portugal, and Italy. The value of green fruit entered for consumption at the port of New York from January 1, 1879, to December 31, 1879, is exhibited in the following table:

Varieties of Fruit.	Value.	Duty.
Oranges and lemons, 20 per cent.	$2,919,003	$583,800.60
Grapes, 20 per cent.	227,014	45,402.80
Pineapples, 20 per cent.	105,297	21,059.40
Bananas, 10 per cent.	382,473	38,247.30
Limes, grape-fruit, shaddocks, plantains, mangoes, mandarins, cantaloupes, melons, sapodillas, alligator pears, manma apples, and watermelons, 10 per cent.	9,315	931.50
Cocoanuts, free	213,438	
Total	$3,856,540	$689,441.60

A comparison of the value of green fruit imported in 1879 with that of 1878 shows an increase in value of $121,490, and of duty, $23,425.

RECENT DECISIONS RELATING TO PATENTS.

United States Circuit Court—Western District of Pennsylvania.—Acheson, J.

STROBRIDGE *vs.* LINDSAY, STERRITT & CO.—COFFEE MILL PATENT.

1. The first claim of reissued letters patent No. 7,583, granted to Turner Strobridge, March 27, 1877, for an improvement in coffee mills, is valid.

2. The mere fact that the device of the defendants has a function additional to that accomplished by the patented invention will not justify the defendants in the use of the latter without liability.

3. Letters patent themselves *prima facie* establish the fact that patentable invention is embraced thereby, and strongly confirmatory of this will be evidence tending to show the favorable acceptance by the public of the improvement and its recognition by the trade as something new and meritorious.

Messrs. Bakewell & Kerr for the complainant.

Mr. B. F. Thurston for the respondents.

United States Circuit Court.—Western District of Pennsylvania.—Strong, J.

ROBERTS *et al. vs.* SCHREIBER.—OIL WELL TORPEDO PATENT.

1. Reissued letters patent No. 6,258, granted to E. A. L. Roberts, January 6, 1875, the claim in which is for "the method or process of increasing or restoring the productiveness of oil wells by causing an explosion of gunpowder or its equivalent at or near the oil-bearing point, in connection with superincumbent fluid tamping, substantially as described," declared to be for the same invention as his original patent dated May 20, 1866, and sustained.

2. The decision in the case of *Roberts vs. Dickey,* 4 Fisher, 532, construing the true meaning and scope of such original patent, approved.

3. The application of a blast in a bore hole sunk in an ordinary well is not an anticipation of a process by which a torpedo may be exploded many hundred feet below the surface of the ground and below the top of the rock through which an artesian well has been sunk, and at the exact point in the well where the effect of such explosion is desired, with a water tamping sufficient to confine the effect to the vicinity of its location.

4. Unsuccessful and abandoned experiments cannot avail to invalidate a patent to an inventor who has disclosed to the public an invention the utility of which has been demonstrated by its general adoption.

5. The cause that works successful results cannot be the same as that exhibited in abandoned experiments, and holding the latter up as anticipations of the former is but an illustration of what is very common—an attempt to defeat a meritorious invention by proof that something similar had been previously known, though it had never been perfected, and had never been any useful contribution to human knowledge or convenience.

6. The process invented by Roberts, as disclosed by his specification, does not require that the superincumbent fluid tamping should fill the well, but that there should be a sufficient column of fluid to confine the effect of the blast.

7. Letters patent No. 47,458, granted to E. A. L. Roberts, April 25, 1865, for improvements in apparatus for exploding gunpowder or other explosive material in artesian or other similar wells, construed and sustained.

By the Commissioner of Patents.—Marble, Commissioner.

EX PARTE MCDOUGALL.—PATENT OIL CAKES.

1. The rule that several distinct inventions cannot be included in a single application is alike applicable whether such inventions be improvements in processes or machinery, and the mere circumstance that several processes pertain to the same subject matter will no more warrant their joinder in a single application than will the bare fact that two machines are in the same class of invention warrant the issue of one patent for the two.

2. Although each of the several "acts" of the "series of acts" constituting a process may be capable of performing separately its own peculiar function, and may be used independently of the others, yet if they all contribute in producing the final result they may be joined in a single application, and a claim may be made to the entire process, and separate claims can also be made to the sub-processes which go to make up the same.

3. Where one has discovered that a desired result can be attained by a process consisting of a series of steps, and that certain of the steps in such process can be replaced by others which will operate in an equivalent manner, a broad or generic claim can be made including all the modifications, and a more limited and specific claim can be made to any one of the modifications.

4. Where in several processes the order in which the several steps follow each is different, as are also the final results attained, the processes cannot be said to be modifications each of the other.

5. Alternative claims and claims for modifications condemned. The mere fact that courts, in order to save a patent, have sustained such claims is no warrant for the Office to shirk its duty in requiring that the claims shall be framed in the clearest and best form, and shall not embrace distinct inventions.

New Varieties of Tea.

An English consul reports the discovery of two curious varieties of tea on the western frontier of China. In the monasteries on Mount Omi (or Ngomi) he was given an infusion of tea which is naturally sweet, tasting like coarse congou with a plentiful addition of brown sugar. It is only grown by the monks on the slopes of the mountain, and two days' further west its existence was unknown. The other variety, odd as it may appear, has the natural flavor of milk, or, perhaps, more exactly of butter. What is most interesting is the fact that it is wild tea, growing in its native elevated *habitat,* without cultivation.

This wild tea is found in the uninhabited wilderness west of Kiating and south of Yachow, at heights of 6,000 feet and upward, and is a leafy shrub 15 feet high, with a stem 4 inches thick. Every part of the plant, except the root, is used for making the infusion; the wood is chopped up and put into a kettle of water with the dried leaves and twigs and being boiled yields a strongly colored but weak tea, possessing a buttery flavor, which gives it some resemblance to the Thibetan preparation.

Cold Air Fruit Curing.

The California *Mountain Messenger* reports an interesting experiment in fruit curing lately made at a Placerville foundry. About a peck of sliced apples were placed in a sieve and subjected to a cold air blast for three and a half hours in the cupola furnace of the foundry, and the fruit is reported to have been completely and beautifully cured by the treatment, remaining soft and without the slightest discoloration. The cured fruit showed none of the harsh, stiff dryness which results from hot curing, the cold blast completely freeing the fruit from excess of moisture, with no possibility of burning or shriveling it. The *Messenger* says: "Compared with our sun drying, it effects a great saving of expense, attention, and risk. Anybody who can command or devise a strong blast of cold air, can dry fruit in a superior—we might say perfect—manner, without being dependent on the weather and waiting on the slow process of sun drying, and without the most expensive resort to fuel and the risk of overheating."

Old-fashion Flowers.

The editor of the *Rural New Yorker* recently visited what he terms an old-fashioned garden, in which were growing and blossoming luxuriantly white herbaceous pæonies, *Pæonia tenuifolia* (single), tree pæonies, larkspurs, Canterbury bells, fox-gloves, June and hybrid roses, and many other good old things, now seldom seen except at some old country home. Are we not, pertinently asks the editor, making a mistake in neglecting these fine old plants? At some future time we may wish for them in vain.

Benjamin D. Frost.

Benjamin D. Frost, civil engineer, under whose supervision the Hoosac Tunnel was constructed, died at St. Louis, Mo., July 19. Mr. Frost was a resident of Massachusetts, but had been in the West several months prosecuting surveys for the improvement of the Mississippi River, in which work he was actively engaged to the end. He was within a few years of completing his fiftieth year.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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Alden Ore Crushers and Pulverizers, six sizes, $45 to $1,500. E. T. Copeland, 30 Courtlandt St., N. Y. city.

Wanted—A Chucking Lathe for general work. A. W. Gray's Sons, Middletown Springs, Vt.

Saw Mill Machinery. Stearns Mfg. Co. See p. 77.

Gear Wheels for Models (list free); experimental and model work, dies and punches, metal cutting, manufacturing, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Fresh air is indispensable; but when you need a fresh pen be sure it is one of Esterbrook's

State Rights for sale. Knife and Fork Scouring Box. Engraving in No. 16, vol. 41, SCIENTIFIC AMERICAN. Sylvester M. Button, 324 W. Dauphin St., Phila., Pa.

All Dealers sell the New $4 Drill Chuck; holds from 0 to 9-16. A F Cushman, Hartford, Conn.

See Stockwell Screw and Machine Co.'s adv., p. 76.

For Best Quality Brass and Composition Castings, address E. Stebbins Mfg. Co., Brightwood, Mass.

For Sale.—A N. Y. Steam Engine Co. 21 inch heavy Slotter, in good order. Address Southwark Fo. & M. Co., Phila., Pa.

Blake's Belt Studs. The best and cheapest fastening for all rubber and leather belts. Greene, Tweed & Co., 118 Chambers St., New York.

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The novel Shading Pen. Sample writing and circular free. See notice and cut this paper, May 1. A set of three sizes by mail, $1. Address J. W. Stoakes, Milan, O.

Asbestos Board, Packing, Gaskets, Fibers, Asbestos Materials for Steam & Building Purposes. Boiler & Pipe Covering, Asbestos Pat. Fiber Co., limited, 194 B'way, N.Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole m'f'rs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Diamond Drills, J. Dickinson, 64 Nassau St., N. Y.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

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Our new Stylographic Pen (just patented), having the duplex interchangeable point section, is the very latest improvement. The Stylographic Pen Co., Room 13, 169 Broadway, N. Y.

Advertising of all kinds in all American Newspapers. Special lists free. Address E. N. Freshman & Bros., Cincinnati, O.

Valve Refitting Machine. See adv., page 77.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Sweetland & Co., 126 Union St., New Haven, Conn., manufacture the Sweetland Combination Chuck.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 52 Dey St., N. Y.

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National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

For Alcott's Improved Turbine, see adv. p. 45.

Forsaith & Co., Manchester, N. H., & 207 Centre St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

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Air Compressors, Blowing Engines, Steam Pumping Machinery, Hydraulic Presses. Philadelphia Hydraulic Works, Philadelphia, Pa.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

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Eclipse Portable Engine. See illustrated adv., p. 62.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

For Sale Cheap.—A Springfield Gas Machine, with 500 light capacity. D. L. E., 16 White St., New York.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 77. Totten & Co., Pittsburg.

Silent Injector, Blower, and Exhauster. See adv. p. 77.

Portable Railroads. Sugar Mills. Horizontal & Beam Steam Engines. Atlantic Steam Engine W'ks, B'klyn, N.Y.

Peck's Patent Drop Press. See adv., page 76.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Brass & Copper in sheets, wire & blanks. See ad. p. 76.

Air Compressors. Clayton Stm. Pump W'ks, Bk'lyn, N.Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For Superior Steam Heat. Appar., see adv., page 77.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 77.

The best Truss ever used. Send for descriptive circular to N. Y. Elastic Truss Co., 683 Broadway, New York.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 78.

Telephones.—Inventors of Improvements in Telephones and Telephonic Apparatus are requested to communicate with the Scottish Telephonic Exchange, Limited, 34 St. Andrew Square, Edinburgh, Scotland. J. G. Lorrain, General Manager.

Nellis' Cast Tool Steel, Castings from which our specialty is Plow Shares. Also all kinds agricultural steels and ornamental fencings. Nellis, Shriver & Co., Pittsburg, Pa.

Blake "Lion and Eagle" Imp'd Crusher. See p. 77.

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburg Steel Casting Company, Pittsburg, Pa.

New Economizer Portable Engine. See illus. adv. p. 77.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

NEW BOOKS AND PUBLICATIONS.

EL UNIVERSO Y LA PARALAXE. Por Francisco Gonzalez, Ingeniero Civil. Chilpancingo. 1879.

The desire of men of science to resolve the great problem of the solar parallax in order to determine, with that exactness required by the present state of science, the true dimensions of our planetary system; the diversity of the values that the history of astronomy has furnished us from the times of Encke and Lalande; and the ardor of the whole scientific world, as evinced by the careful observations that it made on the transit of Venus in 1874, all decided the author of this brochure to devote some months to a resolution of the great problem. This he believes that he has successfully effected—not by the aid of direct observations, however, for he believes that the value of gravity on the surface of the earth, plus the time of the latter's revolution, gives sufficient data for the resolution of the problem. The pamphlet, which is mostly taken up with mathematical calculations, is prefaced with a succinct theory as to the origin of the material universe. The author states that he does not consider universal gravitation as a property inherent to matter, but as an effect of undulation of the elastic and subtle fluid that fills the universe, and which causes every body, every particle of matter, to become a new center of vibration.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) W. R. C. asks how to make a bath to nickel plate about four gallons, and what kind of battery is the best, and about how large for four gallons. Can the bath be made too strong? Can plating be well done in fifteen minutes? A. You will find an article on nickel plating on p. 209, Vol. 38, SCIENTIFIC AMERICAN. Copper can be plated in fifteen minutes under favorable circumstances, but a longer exposure affords much better work

(2) A. L. L. asks for a receipt for making sticky fly paper such as is sold in the drug stores. A. See p. 171 (12), Vol. 39, SCIENTIFIC AMERICAN.

(3) R. C. S. writes: Do you know of any way to keep ants from building mounds in a lawn, or of destroying the ants without killing the grass? A. Try a little oil of turpentine, in very fine spray.

(4) F. G. W. asks how to manufacture carbolic acid. A. Phenol or carbolic acid is commonly obtained from light oil, one of the products of the distillation of coal tar, by rectification in a current of steam which removes cresol, etc. The tailings are agitated with caustic soda, and the alkaline mixture subsequently treated with an acid. This yields about 15 per cent of crude carbolic acid as a separate layer. This is rectified by distillation and dried by heating it to near its boiling point (368° to 370°) in a current of dry air. Otherwise by rectification over anhydrous sulphate of copper. It is still further purified by rectification over litharge. It boils between 368° and 370°.

(5) D. W. R. asks: What is the composition of phosphor bronze, such as is used in mining pumps to resist the action of sulphurous water; and how is this bronze mixed? A. An ordinary copper tin bronze to which has been added in the melting pot ½ to 1 per cent of phosphorus. See p. 409 (30), Vol. 39.

(6) A. B. asks: What is used by the ladies to bleach their hair? A. A strong aqueous solution of sodium sulphite, rendered slightly alkaline with carbonate of soda, constitutes one of the bleaches.

(7) C. O. M. asks: What cheap article can be used for thinning coal tar? A. Benzine or benzole, naphtha, oil of turpentine. 2. What thinning naphtha or light oil is made of? A. It is one of the products of the distillation of petroleum. 3. Where can it be obtained in great quantity? A. Of any dealer in oils.

(8) D. G. B. asks for a simple way of making carbonic acid water or soda water. A. Carbonic acid water is simply water charged with carbonic acid under pressure. The carbonic acid is generated by the action of dilute oil of vitriol (sulphuric acid 1, water 4 to 5) on marble dust in a lead-lined iron vessel capable of sustaining great pressure. This generator is provided with a pressure gauge. The gas at a pressure of 200 lb. or so per square inch is conveyed through a quantity of water in a second vessel to free it from impurities, and then to the bottom of a stout airtight, porcelain-lined, iron cylinder, partly filled with pure water. This is kept in agitation to facilitate the absorption or solution of the gas.

(9) F. H. M. writes: I have a marble mantel in my bedroom which has become discolored from smoke. I have tried several recipes to clean it, but they have all failed; Can you tell me what to use to clean it? A. Moisten powdered quicklime with a strong solution of washing soda in hot water; brush this over the stone and let it dry. Brush off, wash with plenty of water, and polish with a little tripoli.

(10) E. M. asks how to color or dye small pieces of ivory, black. At the same time the pieces must not be dipped into a solution. I desire to put the color on. How can I prepare such a paste? I suppose it must be such. A. Wash well with an aqueous solution of caustic soda, and then with a strong aqueous solution of neutral nitrate of silver. Expose to sunlight (under glass) until black. Repeat if necessary until the proper color is developed.

(11) F. B. asks what the process is for making very thin paper or any other substance insoluble or waterproof by means of ammonia cuprate, and the mode of making the solution. A. Pass ammonia gas into a saturated aqueous solution of cupric sulphate until the precipitate at first formed is completely redissolved. Concentrate over the water bath and pass the paper slowly through this. You will probably succeed better with a strong (sirupy) solution of zinc chloride. 2. Also the mode of making a very thin sheet of gelatine impervious to water. The mode or substance used for casing sausages by the Germans during the French war I think would answer my purpose, as I want something quite thin, impervious to water or nearly so, transparent if possible, and with a good degree of strength and capability of withstanding heat and cold. A. Pass through a strong solution of bichromate of potassa, then expose to sunlight. In preparing the covering for the pea sausages referred to, glue was mixed with a small quantity of bichromate of potash rolled out, formed into shape, exposed to the sunlight, and then thoroughly washed in water.

(12) F. S. P. asks how much calcium sulphate and carbonate a water can contain and be fit for boiler purposes. Also, what is the largest amount of solid matter a water can have dissolved in it and be fit for a boiler? A. Water containing 100 grains per gallon has been used. It should not be used if a purer water can be procured.

(13) D. F. M. asks: 1. How can I dissolve or melt sheet isinglass to mould it without losing its transparency? A. If you refer to mica, it cannot be so moulded or pressed. Glue isinglass (fish gelatine) may be softened by heating it in a vessel over a water bath. A trace of oil will prevent its adhesion to the moulds. 2. Does heat travel through a vacuum? A. Yes.

(14) S. W. W. asks: 1. Can gold be taken from the pounded ore (or rock) by the use of quicksilver? If it can, please tell me how it is done; and how do they get the gold from the quicksilver? I have about a half ton of some very fine rock, but not having much time I would like to know the cheapest and best way to get the gold. I can get plenty more of the rock if it will pay me to work it. A. The finely stamped auriferous ores are mixed with hot water and a few pounds of mercury in large iron pans provided with a stirring apparatus and mullers. The water is kept warm by a steam jacket, and the stirring is kept up until the mercury has absorbed or amalgamated all the gold. The amalgam is then drawn off and thrown upon a chamois skin filter; through this the excess of clean mercury runs, leaving the amalgam on the skin. This is placed in an iron retort and heated, when the mercury distills off (and is collected in water), while the gold remains in the retort. Consult Philip's "Mining and Metallurgy of Gold and Silver," or Percy's "Metallurgy of Gold, Silver and Mercury."

(15) W. P. K. asks for a recipe for coloring bright wire, black or blue, and perfectly smooth, the same as hair pins. A. Asphaltum, 3 oz.; boiled oil, 4 quarts; burnt umber, 8 oz.; mix by heat, and thin with turpentine (oil) before the mixture becomes cool. Dip the wire in this (not too thick) and harden in a japanner's oven at as high a heat as it will bear without blistering.

(16) K. & S. write: We have cast a lot of small plates of lead and antimony to be plated. After plating there remained on the plates a red or rusty appearing spot. What can we do with them so the spot will not show after plating? A. The spots may be due to imperfect alloying in the pot, or, what is more probable to imperfect cleansing preparatory to plating, or careless handling of the clean plates. If proper precaution is taken in these respects the spots will probably give no further trouble.

(17) F. L. B. asks: 1. Can I work a microphone with one telephone receiver? A. Yes. 2. Can I make a microphone out of the graphite in a carpenter's pencil? A. Graphite does not answer the purpose. 3. Would two Daniell's cells, with plates 3x7 inches, work it? A. One cell is sufficient for a microphone. 4. Could I insulate wire for an electro-magnet by varnishing it if I was careful in winding it? A. Yes. 5. Could I make a magnet for a telephone with a sounder magnet? A. No; use permanent magnets. 6. And what is the best way to magnetize it? A. For methods of magnetizing see p. 331 (13), Vol. 42, SCIENTIFIC AMERICAN.

(18) F. S. writes: I have a recipe for making Bengal lights composed of the following ingredients: 8 parts saltpeter, 4 parts sublimed sulphur, and 1 part antimony. The other day I made it up and it only made a common yellow flame. Will you please tell me what to put in it to make a red and blue light? A. Red may be produced by the addition of a small quantity of nitrate of strontium and sugar or charcoal; blue by zinc dust. The following compositions produce fine lights: Red.—1. Chlorate of potash, 32; nitrate of strontia, 48; calomel, 20; shellac, 12; Chertier's copper, 4; fine charcoal, 1. 2. Chlorate of potash, 84; nitrate of strontia, 80; calomel, 51; dextrine, 22; shellac, 18; Chertier's copper, 4. Purple.—1. Chlorate of potash, 28; Chertier's copper, 28; calomel, 13; shellac, 8; stearine, 1. 2. Chlorate of potash, 40; calomel, 28; Chertier's copper, 28; dextrine, 10; stearine, 3. These colored lights should never be burned indoors, as the vapors they give off are poisonous.

(19) A. L. F. asks: 1. How much working pressure will a cylindrical boiler, 12x20 inches, made of No. 26 galvanized iron, safely stand? A. From 20 to 23 lb. per square inch. 2. Dimensions of safety valve and adjustment to blow off at required pressure? A. ¾ inch diameter. You can put 8¾ lb. direct on valve. 3. How large a pump is required for same, and at what speed should it be run? A. About ½ inch diameter by 3 to 4 inch stroke. The speed will depend upon the rapidity of evaporation. You can control the supply to the pump by a valve.

(20) A. W. R. writes: What are the conditions necessary to success in the "blue photo process" of copying tracings? A. Use pure linen paper, free from chlorides (bleach). Keep it for some time, before sensitizing and after, until required for use, in darkness; use as soon after preparing as possible, and wash thoroughly after printing in running water. See p. 410 (14), Vol. 40.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

July 6, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Acid, pulverulent preparation of phosphoric, E. N. Horsford 229,705
Addressing machine, R. Dick (r)..... 9,282
Aging liquors, process and apparatus for, J. L. Martin 229,542
Air cooling process and apparatus, Portner & Eils 229,750
Baking powder, acid phosphate for, C. A. Catlin. 229,518
Baking powder, preparation of potassium phosphate for, Wilson & Catlin 229,573
Baking power, preparation of sodium phosphate for, Wilson & Catlin..... 229,574
Barrel hoop, E. Hale 229,699
Bath waste and overflow, S. G. McFarland..... 229,627
Bed, invalid, W. W. Snell..... 229,559
Bell, gong and signal, E. W. Vanduzen 229,567
Bell striker, E. W. Vanduzen 229,564
Bell wires, angle for, E. W. Vanduzen 229,566
Bells, attaching clapper strings to, E. W. Vanduzen 229,565
Bells, hanging, E. W. Vanduzen..... 229,568, 229,569
Bells, line stand for steamboat, E. W. Vanduzen. 229,570
Bellows, J. Van Eps..... 229,563
Billiard table, S. R. Mathewson..... 229,625
Bird cage, F. T. Pinter..... 229,634
Blotter, rule, and paper cutter, comb'd, C. Sneider 229,768
Book binding, F. S. Hasbrouck (r)..... 9,275
Book mark, H. R. McCalmont 229,626
Book rack, J. Murphy 229,740
Boot and shoe edge setting machine, C. K. Bradford 229,517
Roots and shoes, making inner soles for, J. F. Ross 229,556
Bottle stopper, J. Erdmann..... 229,595
Bottles, etc., wrapper or envelope for, R. H. Thompson..... 229,775
Bougie, E. Pfarre..... 229,633
Brick, J. S. Smith..... 229,766
Brick linings, laying, Mann & Singer..... 229,724
Bridle, R. Arnold..... 229,792
Brush holder, blacking, H. B. Perham 229,748
Bucket, slop, G. W Knapp..... 229,714
Button attachment, F. J. Rosenberg..... 229,557
Calendar, A. R. Baker 229,578
Calendering paper, method and apparatus for, M. Newton..... 229,551
Can, I. Porter..... 229,749
Can top, R. Gillespie 229,531
Candy, manufacture of, C. G. Brommer 229,667
Car brake, G. D. Paul 229,747
Car, construction, G. F. Harris..... 229,702
Car coupling, C. J. Bell..... 229,660
Car coupling, Deamude & Cannon 229,679
Car coupling, C. H. Shippee 229,763
Car coupling, railway, A. Middleton 229,731
Car door, grain, Latta & Neall 229,716
Car doors, operating, W. W. Riley..... 229,755
Car, railway freight, E. B. Ward..... 229,778

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Car, stock, F. W. Becker 229,659
Cars, etc., ventilating railway, J. S. Lloyd 229,720
Carpet lining fabric, D. Hunt, Jr 229,535
Carriage and cradle, combined baby, A. J. Marsh 229,623
Cartridge loader, C. W. Corr 229,523
Chains, making curbed, P. Nerney 229,742
Chair seating machine, J. C. Miller 229,734
Churn, J. Foreman 229,597
Churn, G. W. Freeman 229,599
Churn, A. Mearns 229,729
Churn dasher, H. W. White 229,784
Clamp, T. J. Carrick 229,670
Clasp knife, E. Jansen 229,706
Clock case, J. Scheina 229,643
Cloth shearing machine, D. C. Sumner 229,648
Clutch, J. D. Westgate 229,652
Clutch, automatic safety, B. E. Henriksen 229,606
Coffee extract, Gue & Grant 229,697
Coffee pot, H. C. Rice 229,610
Coffin handle, G. S. Eaton 229,683
Coin separator, J. H. Junkin 229,712
Compasses, dividing, J. D. Litle 229,619
Confections, apparatus for dipping and coating, Murdock & Haynes (r) 9,286
Corset, C. W. Foster 229,598
Corset clasp, P. Laflin 229,617
Cotton opener beater, R. Kitson 229,615
Cranks, substitute for, S. W. Hanson 229,700
Cultivator, wheel, J. W. Hudson 229,534
Curtain fixture, H. Boss 229,665
Cylinder, reducing and triturating, J. R. Alsing 229,577
Dam and lock, J. Du Bois 229,682
Damper, furnace, E. W. Anthony 229,515
Dental engine, E. T. Starr 229,645
Dental engine treadle mechanism, W. A. Johnston 229,614
Dental plugger, E. T. Starr 229,769
Derrick, E. J. Marsters 229,624
Dividers, proportional, J. M. Villa 229,777
Dredging machine, J. Menge 229,730
Ear piercer, J. Böning 229,581
Edge trimmer and burnisher, D. F. Hallahan 229,698
Electric light regulator, M. G. Kellogg 229,536
Electric signal apparatus, H. G. Fiske 229,529
Electric switch board, J. S. Ross 229,757
Elevator, Smith & Davidson 229,558
Elevator and carrier, combined, J. P. Hillard 229,703
Elevators, electrical safety device for, W. E. Sawyer 229,658
Extension settee table, M. Gossett 229,692
Fabrics, putting up, J. J. Scholfield 229,759
Fanning mill, G. Brooks 229,668
Fare register, J. B. Benton 229,662
Faucet, O'Brien & Splan 229,743
Faucet, beer, Redmond & White 229,637
Faucet, rotary measuring, D. Drawbaugh 229,592
Ferrule, J. H. Greenleaf 229,603
Filter, D. C. Otis 229,744
Firearm, breech-loading, W. W. Greener 229,604
Fire escape, L. Teven 229,561
Fire kindler, H. Finck 229,596
Flour bolt, J. Barkley 229,579
Foil, making ornamental metallic, H. S. & L. Crooke 229,677
Foil wrapper, rolled, H. S Crooke 229,676
Folding stand, Freeborn & Chase 229,600
Fruit jar, R. B. Reilay 229,638
Game apparatus, G. Wunderlich 229,791
Gas burner, multiple, A. M. Silber 229,765
Glass mould, F. A. Weise 229,779
Gold saving apparatus, B. Tyson 229,650
Governor, dynamometrical engine, H. Knudson 229,713
Grain and seed separating screen, B. F. Pettit 229,632
Grain binder, J. F. Gordon 229,693
Grain binder, J. H. Mudgett (r) 9,280
Grain loading scoop and elevator, W. S. Morden 229,737
Graphite from foreign substances, separating, H. Burgess 229,669
Grinding and reducing mill, B. F. Crabbs 229,589
Grinding mill mixing and feeding apparatus, J. P. Lowell 229,722
Halter trimming, E. G. Latta 229,717
Hand and foot motor, D. W. Mott 229,739
Harness attachment, C. H. & C. H. Easte, Jr 229,594
Harrow tooth, F. G. Winnek 229,788
Harrow, wheel, C. Murray 229,548
Harvester, J. Bordwell 229,584
Harvester, A. J. Hodges (r) 9,279
Harvester, W. F. Randolph (r) 9,276
Hatchway safety gate, F. M. Baker 229,657
Hay, apparatus for slinging and elevating, M. Potter 229,553
Hay rake, horse, Galloway & Larsen 229,530
Hermetically sealed jar, L. Lenglet 229,537
Hoisting and loading apparatus, J. Fisher 229,528
Horses, apparatus for breaking and subduing, D. Magner 229,541
Horseshoe, supplemental, C. G. Hill 229,607, 229,608
Hose nozzle, J. Clifford 229,521
Hose nozzle, A. M. Granger 229,695
Hydraulic elevator, D. P. Davis 229,591
Hydraulic motor, J. F. Montross 229,736
Hydrocarbon furnace, B. F. Sherman 229,762
Ice cream beater, J. McAnespey 229,726
Insulated electric conductor, A. F. Moore 229,735
Iron or other metals with tin, etc., machine for coating sheet, J. F. Duffy 229,527
Ironing machine, J. S. Rubio 229,758
Jail or prison, G. H. Maetzel 229,540
Kitchen table, A. K. Hoffmeier 229,533
Knitting machine, G. Johnstone 229,709
Knitting machine burr, Vermilyea & Norris 229,651
Ladder, extension step, H. E. Phelps 229,552
Land roller, T. B. Patton 229,746
Leather punching machine, R. W. Owen 229,631
Lifting jack, J. F. McCormick 229,727
Liquid holder, Adams & Haynes 229,576
Lock washer for nuts, L. Garrigus 229,601
Loom, chair seat, J. C. Miller 229,732
Magneto-electric machine, T. W. Livingston 229,719
Mail bag label holder, J. W. & R. J. McKelvey 229,628
Malt and hop drier, A. J. Reynolds 229,639
Match box, G. Wenström 229,780
Matched hook, M. L. Mount 229,738
Meat, machine for filling cans with, L. Cutting 229,590
Millstone balancing device, J. B. Withee 229,787
Mining and drilling machine, coal, W. Weaver 229,781
Moulding machine, H. L. Eames 229,593
Motion, machine for transmitting, C. P. Grout (r) 9,284
Mower, lawn, Martin & Paxson 229,725
Music, apparatus for illustrating the principles of, J. C. McClain 229,545
Music leaf turner, A. Ramseyer 229,554
Music stand, E. B. Mansfield 229,622
Necktie or scarf holder, C. B. Carman 229,519
Nut lock, J. T. Sipe 229,764
Organ, reed, G. L. Grout 229,605
Ores, extracting precious metals from, T. C. Clark 229,586
Oven, baker's, S. Lord 229,539
Padlock, permutation, H. F. Webb 229,782
Paper boxes, manufacture of, F. R. Duck 229,524
Paper machines, guide roller for, T. Pusey 229,636
Paper, manufacture of, G. B. Fox 229,690
Paper pail, F. M. Davis 229,678
Paper pulp, wood grinder for making, S. M. Allen 229,513
Paper shovel blade, W. H. Murphy 229,741
Pencils, machine for trimming the ends of lead, H. C. Benson 229,661
Photographs on linen, producing colored, L. Graf 229,694
Picture frame, easel, R. Wright (r) 9,281
Pill box, H. S. Maynard 229,543
Pills, process of and apparatus for coating, J. A. Whitney 229,785
Pills with semi-fluid, device for coating, H. S. Maynard 229,544
Pipe coupling, W. M. Stuart 229,771
Piston, steam, H. A. Jamieson 229,613
Planter, corn, C. Berryman 229,516
Planter, corn, L. Grieser 229,696
Poke, animal, A. & E. Larrowe 229,618
Potato digger, T. R. Gray 229,602
Pottery, tile, and glass furnace, G. Duryee 229,525
Printing machine delivery apparatus, C. Potter, Jr. 229,635
Printing press, oscillating, E. M. Coryell 229,675
Pulp, machine for reducing wood to, C. W. Clark. 229,588
Pump, H. A. Jamieson 229,612
Pump, cattle, J. P. Clement 229,587
Pump regulator, steam, C. E. Spiller 229,644
Rail joint, J. Lockhart 229,538
Railway, portable, N. W. Condict, Jr 229,674
Railway rail, J. H. Collingwood 229,522
Railway switch, J. B. Carey 229,671
Railway switch, J. T. Richardson 229,754
Railway switch, safety automatic, O. Pagan 229,745
Railway track, D. E. Dutrow 229,526
Railways, deadening noise on, E. Rider 229,641
Reclining chair, D. B. Hartley 229,701
Refrigerator car, S. Hughes 229,611
Revolving chair, double, L. Holl 229,704
Riveting tool, E. P. Farnum 229,688
Rocking chair, E. Michaels 229,733
Saw, C. Suisse 229,772
Saw file, H. A. Kimball 229,616
Sawing machine, drag, Smith & French 229,767
Scale beam, C. H. Bidwell 229,663
Sewing machine, Miller & Diehl 229,629
Sewing machine guide, J. F. Schroeder 229,760
Shovel, W. Chisholm 229,520
Shovel blanks, manufacture of, H. M. Myers 229,550
Show box cover, E. W. Albee 229,654
Shutter, J. G. Wilson 229,786
Soldering machine, C. R. Merriam 229,546
Spade, H. M. Myers 229,549
Spark arrester, Russell & Burgess 229,642
Sponge moistener, J. J. Doyle 229,680
Steam boiler covering, G. F. Lynch 229,620
Steam engine cylinder lubricator, C. E. Johnson 229,710
Steering gear for traction vehicles, Land & Campbell 229,715
Still, alcohol, C. J. T. Burcey 229,585
Stool, H. A. Seymour 229,761
Store service apparatus, J. C. White 229,783
Stove cone attachment, J. H. Egan 229,684
Stove pipe blank, G. Hipwell 229,532
Stove platform, E. Detwiler (r) 9,277
Stove shelf, W. E. Walker 229,572
Stoves, adjustable rolling support for, C. D. Woodruff (r) 9,283
Straw carrier, F. W. & T. B. Sumner 229,649
Stump puller, P. C. Thompson 229,776
Sugar into lumps, apparatus for chopping, McCrea & Cowper 229,728
Summer furnace, G. F. Robinson 229,756
Tag, butcher's, Allsop & McKenna 229,514
Telegraphic switch board, C. E. Chinnock 229,672
Temple teeth, tool for setting, E. S. Stimpson 229,646
Tether, W. L. Gerard 226,691
Thill coupling, W. Harder (r) 9,278
Thill coupling, C. Renner, Jr 229,555
Thill coupling, T. M. Richardson 229,753
Thread cleaning and polishing mechanism, C. Ellis 229,686
Tire upsetter, A. H. Struppler 229,647
Toy pistol, H. S. Lockwood 229,721
Toy shooting gallery, C. A. Bailey 229,656
Tray, child's table, A. Turner (r) 9,285
Truck, hand, J. S. Stewart 223,770
Type case, printer's, L. D. Evans 229,687
Type writing machine reel, W. K. Jenne 229,707
Umbrella, A. H. Ege 229,685
Umbrella, R. Ray 229,752
Valve, balanced, W. P. Tatham 229,773
Valve gear, engine, P. Josserand 229,708
Vehicle dash, A. Z. Boda 229,582, 229,583
Vehicle spring, A. D. Hickok 229,609
Vehicle spring, Morrow & Bush 229,630
Velocipede, W. Albrecht 229,655
Velocipede, C. M. Trautmann 229,562
Venting sealed cans, J. Wolff 229,789
Wagon brake, H. H. Woodford 229,575
Wagon brake lever, A. C. Fish 229,689
Wagon lock, Sprague & Perry 229,560
Washing machine, I. Hoover 229,610
Washing machine, M. L. Julian 229,711
Washing machine, F. L. Mitchell 229,547
Watch case bow, J. C. Dueber 229,681
Watch, stop, H. A. Lugrin 229,723
Water cooler, G. Booth 229,664
Water gauge, E. W. Vanduzen 229,571
Water wheel, turbine, T. S. Pylant 229,751
Whiffletree hook, W. J. Woods 229,790
Whisky, making, Allen & Bradley 2 9,653
Windwheel, F. H. Bolte 229,580
Windmill, M. D. Thayer 229,774
Window opener, A. K. Mansfield 229,621
Wire and rods, machine for coiling, W. J. Lewis 229,718
Wrench, L. Coes 229,673
Wringer, R. C. Browning 229,666

DESIGNS.

Bulletin board, railroad, A. S. Mann 11,841
Carpet, H. Horan 11,840
Carpet, D. McNair 11,842, 11,843
Carpet, J. Neil 11,849
Carpet, G. W. Piggott 11,851, 11,852
Chain, ornamental, J. A. Lieb 11,855
Chair, E. L. Buckingham 11,839
Coffin handle socket, W. E. Stevens 11,857
Fireplace, W. C. Peet 11,850
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Pulverizing grain, ores, etc., L. S. Chichester, Jersey City, N. J.
Pump, H. S. Lockman, *et al.*, New Brighton, N. J.
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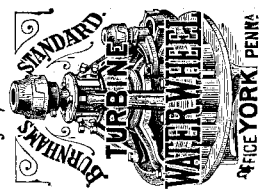

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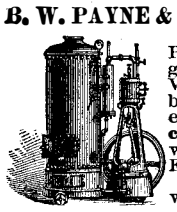

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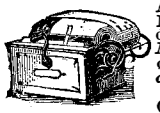

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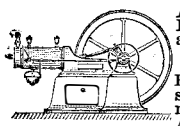

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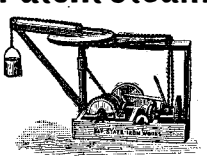

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As the public exposure and searching examination necessary to intelligent bidding on any prescribed model of a lock and key would tend to impair, if not entirely destroy, the further utility of all such locks and keys for the purposes of the mails, the Postmaster General prescribes no models or samples for bidders, but relies for a selection on the mechanical skill and ingenuity which a fair competition among inventors, hereby invited, may develop in samples submitted by them.

Proposals, with samples, will also be received at the same time, for Safety Chains for Mail Keys.

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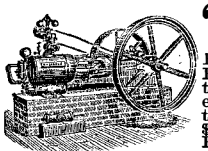

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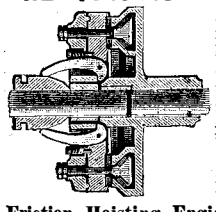

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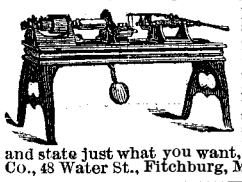

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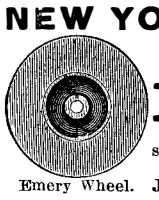

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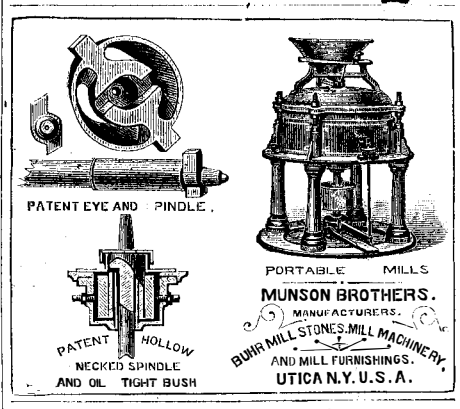
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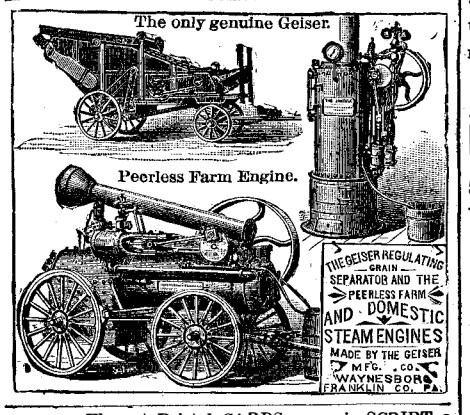
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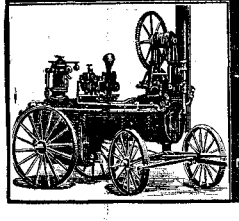

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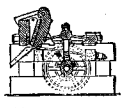

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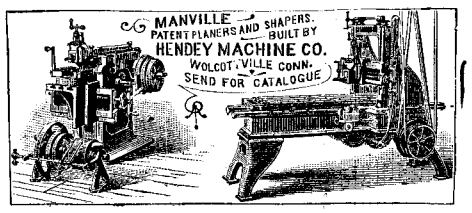

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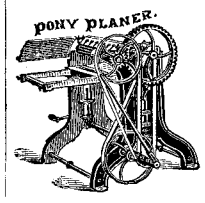

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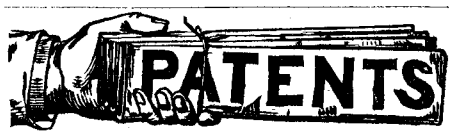

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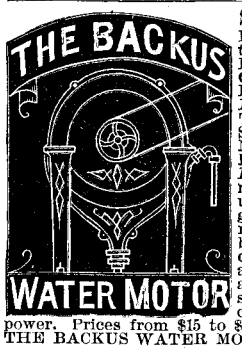

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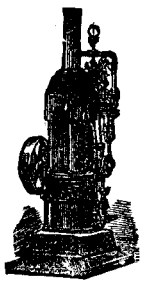

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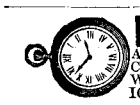

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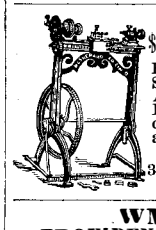

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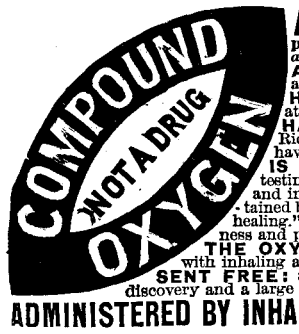

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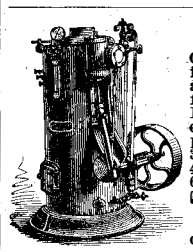

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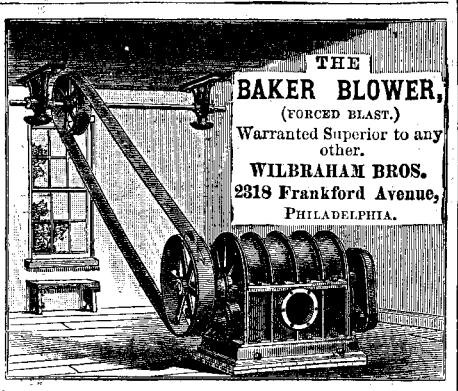

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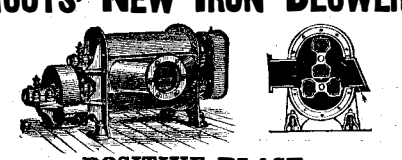
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